SCIENCE.

FRIDAY, FEBRUARY 18, 1887.

COMMENT AND CRITICISM.

BY THOSE WHO READ aright the signs of the times, it is seen that important advances in education are destined to be made in the not very distant future. And those advances are not to be, as some have been in the past, wholly or partly destructive. For a true philosophy of progress, a destructive advance does not exist. The present is rooted in the past, and the future will draw its nourishment from the present. Any change or development is conditioned by that which is changed and developed. We cannot destroy present conditions if we will. We may alter, amend, or counteract them, but their annihilation is possible neither in thought nor fact. Therefore it is that those educational reformers who would sweep away all that now exists, before they begin their work of construction, are harmful agitators. They raise a demand that they cannot supply. They waste time, and thought, and money. The true educational progress is going to be more scientific, more philosophic, than this. It will take things as it finds them, and mould them to its purpose. It is no sign of sound educational thinking to join the senseless clamor for the sweeping-away of Greek, or philosophy, or every thing else that cannot be at once coined into dollars and cents. Utility is never going to be the test of the true education. The true progress will suffer no such lowering of its ideal. It will keep before it, as its aim, the development of man, and the whole man, as man. But it will ask whether we have not overlooked some of man's faculties. It will inquire with what reason we have in the past instituted a feudal system among the human powers, which relegates some of them to an undignified servitude, and gives to others all the honor and esteem. Have we not overstepped the limits of science in this respect?

Locke called the senses the 'windows of the soul,' but we have, to a great extent, closed or defaced those windows, without reflecting that by so doing we were denying to the soul some of its possibilities of development. Some senses we have neglected entirely, others we have educated only in part. The eye is taught to read, and the hand to write, but neither is taught to draw, or to mould and fashion. Many of the refinements of the sense of touch are also entirely passed over. To remedy these, and similar omissions in our education, not destruction but construction is necessary. Keep what we have that is good, but rearrange it, that the elements hitherto neglected may find a place in the scheme. The education that will do this, is the new education, but it is sadly in need of a name. Words merely stand for ideas, to be sure, but sometimes a word adds to the definiteness of the idea it represents. 'Manual training' will not do, for that conveys the idea of teaching a trade. The new education will not do this. 'Industrial education' will not do, though a meaning, not explicitly conveyed by the words, may be read into the phrase. Yet this means ambiguity, and ambiguity means loss of force and directness. A name is wanted, but it must, to be satisfactory, stand for the idea we have outlined. It must not mean the training of the hand and eye alone, but the training of the mind through the hand and eye. And it must not exclude the older instruction, which is excellent as far as it goes, but which does not go far enough. It is this — the old plus the new — which we mean by the new education.

THE RECENT ARTICLE in the *Contemporary review* on university education in the United States, by President Charles Kendall Adams of Cornell, is a very clear and succinct account of the progress of thought on university subjects in this country during the past half century. It should be particularly welcome to those European students of educational science who desire to understand the development of educational thought in this country. President Adams shows very clearly that the establishment of our scientific and technical schools, the founding of parallel courses, as at Cornell and Michigan universities, and the building-up of the elective system, as at Harvard, were all the outcome of the same desire, — to satisfy the increasingly critical demands as to higher education. President Adams sustains President

Eliot in all the latter's recent controversies respecting his favorite elective system, and seems to show himself quite as favorably disposed toward the elective system, pure and simple, as toward the scheme of parallel courses, to the development of which he has hitherto given so much thought. The article will shed a flood of light upon the educational discussions in this country as they appear to foreign readers, and it will set some facts even more clearly before our own countrymen.

WHAT TEACHERS SHOULD READ, is an interesting question, and one about which there is more or less misconception. Some persons seem to think, that, because teachers are teachers, they cease to be men and women. At least this is the inference which we feel justified in drawing from much that is written and said on this subject. Lists of books that it is desirable that teachers should read, are drawn up, but in nine cases out of ten they contain none but professional works. This is undesirable, for a variety of reasons. In the first place, it narrows the teacher's view, confines his sympathies, and aids in the development of notions and methods best denominated as 'cranky.' Then, too, pedagogic literature is not a thing to be indiscriminately recommended to teachers. It needs severe critical revision, before all the harmful and time-wasting elements in it are eliminated. Rosenkranz points out, in his 'Philosophy of education,' that the treatises on education abound more in shallowness than any other literature. Short-sightedness and arrogance, he says, find in educational literature a most congenial atmosphere, and uncritical methods and declamatory bombast flourish there as nowhere else. All this must be recognized and guarded against; and from what we see of current educational literature, periodical and otherwise, it is not yet recognized and guarded against sufficiently. An inconceivable amount of nonsense is talked and written about education. Dr. William T. Harris, in a recent note on this subject of reading for teachers, very sensibly urges a course of reading for teachers that will secure general culture, and furnish new inspiration in the task of instruction. Dr. Harris mentions a number of books as suitable for this purpose, and, though neither complete nor satisfactory, it serves well enough to emphasize the fact that teachers retain their humanity, and by how much the more they cultivate and broaden it, by so much do they increase the value and efficiency of their teaching-powers.

DR. WITHERS-MOORE'S ADDRESS on the subject of the higher education of women, delivered before the British medical association, has raised a great storm of indignation among the advocates of women's higher education, both in England and in this country. We have, from time to time, called attention to various phases of the argument as it has proceeded. Mrs. William Grey, in a paper read recently before the ladies' council of education, at Leeds, is the last participant in the controversy. She passes by Dr. Withers-Moore's argument, with the remark that no time need be wasted in 'flogging a dead horse,' and criticises at some length the statement of Dr. B. Ward Richardson, that, "there is nothing in women's constitution, physical, moral, or mental, to prevent their competing successfully with men in any field of labor whatsoever, *provided they will pay the price for it.*" This price Dr. Richardson had asserted to be the loss of grace and beauty, and the renunciation of all the joys of home and family, especially motherhood. Mrs. Grey admits that marriage so severely handicaps a woman that there is little if any chance of her reaching the top of the professional tree. She claims, however, that Dr. Richardson's arguments, in common with those of nearly all writers and speakers opposed to the 'claims of women,' are vitiated by the fact that they apply, not to women as a sex, but only to that small minority whose circumstances permit them to choose between work and idleness, — "between going into the battle of life, or sitting at home at ease, while it is fought for them by others."

This minority is so small that Mrs. Grey prefers to regard it as constituting the exceptions to the universal rule that women, as a sex, take, if anything, more than their fair share in the hard work of the world, while fulfilling at the same time their special function of motherhood. She quotes some instances from her experiences in Italy, and becomes indignant at the idea that the strain upon a woman's physical powers unfits her for her peculiar functions as a mother. "The hollowness of the talk about woman's work, and what they have or have not strength for," says Mrs. Grey, "is made manifest the moment we look outside drawing-rooms to the real facts of woman's life as a whole." It might be suggested, in reply to this argument, that it is precisely this class of women, whom Mrs. Grey treats as exceptions to the general rule, that the higher education

reaches. It certainly cannot reach women as a sex any more than it now reaches men as a sex. It may be that the classes of women, the majority who work hard and the minority who lead a life of relative ease, have become so far distinct that the same argument will not apply to both. If so, considerations drawn from the study of the class which the higher education is not expected to reach, become no longer pertinent when applied to the class of women who will, if any, receive the benefits of the proposed training. There is, unquestionably, much hasty and impulsive expression of opinion on this important question, but may it not also be true that there is some loose thinking concerning it?

THE ELEVENTH ANNUAL REPORT of President Gilman to the trustees of the Johns Hopkins university is largely a retrospect of what the university has accomplished during the decade of its existence. Much that the president says, he has told us before, or it has been embodied in the university publications. The aim of the collegiate instruction is defined to be, "the training of the mind and character to habits of fidelity, attention, perserverance, memory, and judgment," and in pursuance of that aim, the well-known group system has been put in operation, so as "to secure a positive amount of regulation with a certain amount of freedom." During the decade, fellowships have been bestowed upon one hundred and thirty-four individuals, and to this fellowship system President Gilman ascribes — and with reason — much of the success of the university. By far the major number of these fellowships have been bestowed upon students of science, — biology, chemistry, mathematics, physics, geology, and engineering having had seventy-eight fellows, while all the languages, together with historical science and philosophy, have had but fifty-six allotted to them. In apparatus, library, and publications, the university is well supplied, though much remains to be done in all these directions. President Gilman also has something to say regarding the effect of scientific advance on the moral and spiritual nature of man. He expresses the conviction that "man's consciousness of his own personality, with its freedom and responsibility, his belief in a Father Almighty, his hopes of a life to come, his recognition of a moral law and of the authority of an inward monitor, will stand firm, whatever discoveries may be made of the evolution of life, the relation of soul and body, the nature of atoms and of force, and the conceptions of space and time. Science shows us that all knowledge proceeds from faith, — the assumption of premises in which the investigator believes."

An interesting feature of the report is the selection made by President Gilman from papers submitted to him by the several heads of departments, summarizing the work performed by each, and the theory on which the department has been organized. Of the classical instruction, Professor Gildersleeve writes: "In organizing the classical department, the importance of both sides, the scientific and the literary, was carefully considered. Without scientific study, the cultivation of the literary sense is apt to degenerate into finical aestheticism; kept apart from the large and liberal appreciation of antique life in all its aspects, the scientific study of the classic languages divorces itself from sympathy with tradition, and relinquishes its surest hold on the world of culture, on which the structure of the university must rest. . . . All university students should work in common. The leader should assign no work that is without its lesson to the most experienced student, or without its stimulus to the merest novice. . . . The history of the last ten years shows that the steadfast adherence to these lines of work has won for the university an influence that manifests itself far beyond the domain which it now occupies, and which it has been persistently extending." The work in history and political science is adapted to the needs of three classes of students, the undergraduates, the undergraduates who want to give special attention to historical studies, and the graduate students. Professor Remsen's idea has been, that it is better "to train thoroughly a small number of chemists than to make a large number of mere analysts," And in a similar way other professors outline their scheme of work. Thus, President Gilman has brought together, not merely data of interest to the friends of Johns Hopkins university, but expressions of opinion from eminent men as to how higher instruction in their several specialties can best be organized.

SOME EDUCATIONAL JOURNALS, in taking notice, as we did, of the action of the authorities of a state teachers' association in mitigating the text-book and school-journal peddling nuisance at a recent meeting, are disposed to blame the authorities for

having taken an unjustifiable step. We are disposed to believe that these papers must have been among those whose activity was curtailed at the meeting in question. One of them, for example, naïvely inquires whether it is "a worse crime to exhibit and explain a book at an educational gathering than to show the use of a plow at an agricultural fair." We would point out that this analogy is fallacious. The end and aim of an agricultural fair is to see and examine all the new agricultural implements and products, and the demonstration of the virtues of a certain plow is precisely what the spectators have come to see. An educational gathering, on the contrary, is not called together once a year, or once in six months, to examine and compare books and papers, but to study and discuss, under the guidance and leadership of appointed speakers, questions pertaining to the theory and practice of the teacher's profession. If an exhibit of text-books and school-journals can be arranged so as not to interfere with the proper carrying out of the object of the meeting, let it be done. Such an exhibit can do little harm, and may do much good. But the representatives of publishing houses do not always stop here. They make themselves a good deal of a nuisance, and interfere with the work of the association. We fancy that it was this feature of the exhibit that was objected to in Massachusetts, and we heartily commend those in charge of the arrangements for the meeting, for putting a stop to it.

LEFT-HANDEDNESS. — A HINT FOR EDUCATORS.

DR. DANIEL WILSON, president of the Royal society of Canada, has lately contributed a paper to the Proceedings of that society on the subject of left-handedness, to which he has managed to give an unexpected and very practical interest, affecting all who have children or who are concerned in their education. The author had written previously on this subject, but not with such full and effective treatment. He reviews the various causes to which the general preference of the right hand has been ascribed, and also those to which the occasional cases of left-handedness are attributed, and finds them mostly unsatisfactory. He shows clearly that the preferential use of the right hand is not to be ascribed entirely to early training. On the contrary, in many instances, where parents have tied up the left hand of a child to overcome the persistent preference for its use, the attempt has proved futile. He concludes that the general practice is probably due to the superior development of the left lobe of the brain, which, as is well known, is connected with the right side of the body. This view, as he shows, was originally suggested by the eminent anatomist, Professor Gratiolet. The author adopts and maintains it with much force, and adds the correlative view that "left-handedness is due to an exceptional development of the right hemisphere of the brain."

A careful review of the evidence gives strong reason for believing that what is now the cause of the preference for the right hand was originally an effect. Neither the apes nor any others of the lower animals show a similar inclination for the special use of the right limbs. It is a purely human attribute, and probably arose gradually from the use, by the earliest races of men, of the right arm in fighting, while the left arm was reserved to cover the left side of the body, where wounds, as their experience showed, were most dangerous. Those who neglected this precaution would be most likely to be killed; and hence, in the lapse of time, the natural survival would make the human race, in general, 'right-handed,' with occasional reversions, of course, by 'atavism,' to the left-handed, or, more properly, the ambi-dextrous condition. The more frequent and energetic use of the right limbs would, of course, react upon the brain, and bring about the excessive development of the left lobe, such as now generally obtains.

The conclusions from this course of reasoning are very important. Through the effect of the irregular and abnormal development which has descended to us from our bellicose ancestors, one lobe of our brains and one side of our bodies are left in a neglected and weakened condition. The evidence which Dr. Wilson produces of the injury resulting from this cause is very striking. In the majority of cases the defect, though it cannot be wholly overcome, may be in great part cured by early training, which will strengthen at once both the body and the mind. "Whenever," he writes, "the early and persistent cultivation of the full use of both hands has been accomplished, the result is greater efficiency, without any corresponding awkwardness or defect. In certain arts and professions, both hands are necessarily called into play. The skilful surgeon finds an enormous advantage in being able to transfer his instrument from one hand to the other. The dentist has to multiply instruments to make up for the lack of such acquired power. The fencer who can transfer his weapon to the left hand, places his adversary at a disadvantage. The lumberer finds it indispensable, in the opera-

tions of his woodcraft, to learn to chop timber right and left handed; and the carpenter may be frequently seen using the saw and hammer in either hand, and thereby not only resting his arm, but greatly facilitating his work. In all the fine arts the mastery of both hands is advantageous. The sculptor, the carver, the draughtsman, the engraver and cameo-cutter, each has recourse at times to the left hand for special manipulative dexterity; the pianist depends little less on the left hand than on the right; and as for the organist, with the numerous pedals and stops of the modern grand organ, a quadrumanous musician would still find reason to envy the ampler scope which a Briareus could command." That all this is true is abundantly shown by the numerous examples cited by the author, — from the greatest of artists, the left-handed Lionardo da Vinci, to the distinguished ex-president of the American scientific association, Prof. Edward F. Morse, and (we may add) to Dr. Wilson himself, both of whom are known to be accomplished draughtsmen with this too-neglected hand. In view of these facts, it is evident that few more important subjects can be offered for the consideration of educators than that which is presented in this impressive essay.

THE HUPA INDIANS: AN ETHNOGRAPHIC SKETCH.

ONE who has charge of a museum is frequently told, "I should be delighted to help you if I only knew what you want." In the former articles of this illustrated series special arts have been elaborated in order to explain the completeness desired in anthropotechnic collections. The present paper appeals to the traveller, the missionary, the army or navy officer or private, and shows what any one of them may do at his leisure.

Since his expedition to Point Barrow, Lieutenant Ray, U.S.A., has been stationed at Fort Gaston, in north-west California, on the lower Trinity River. Here is the Hupa reservation, and here dwell what are called the Hupa Indians, — bands known by various names, but nearly all belonging to the Pacific coast branch of the great Athabascan stock, represented by the Kulchin and Tinné on the north, and by the Apache and Navajo on the south. Before these aborigines were terrorized by the white miners and fishermen, they were, in the language of Stephen Powers, the Romans of California. Although they have been calmed down to the normal stagnation of a government reservation, there remains a great deal of the old art and civilization among them. They are really in the neolithic age, and may tell us much about the way in which Frenchmen of the Robenhausien epoch lived.

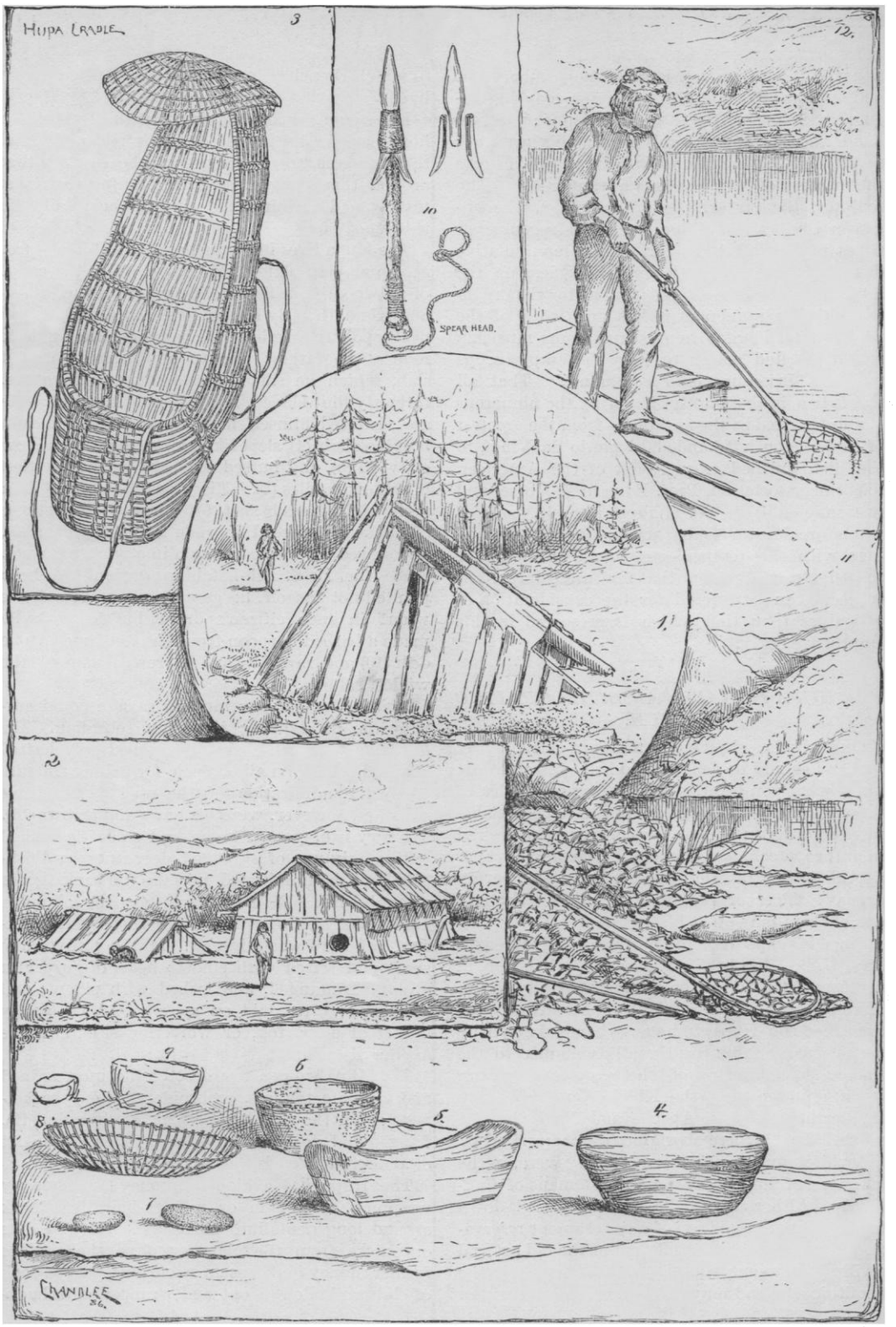
If we commence by saying that their mountain homes are in the midst of giant redwoods, that their streams are the resorts of the salmon, that around them grow the materials for the finest textiles and clothing, the story of their daily life is blocked out.

The Hupa lives in a puncheon or slab house (see accompanying plate, 1, 2), and paddles his canoe of redwood in the fish-prolific waters of the Trinity and Klamath. By means of elkhorn wedges and neatly polished, bell-shaped hammers, he is able to reduce the largest tree to any desired form of slab, which he smooths and shapes with adzes, formerly flint-bladed, now edged with steel. He also cleansed himself in a sweat-house, sat on a humble chair (4), slept like an oriental on a pillow of wood (5), and nursed his baby in the prettiest of willow cradles (3). His mush he cooked in a water-tight grass basket (6) by means of hot stones (7), baked his bread in rude soapstone pans (9), and served his roasted salmon in a wicker tray (8). Since the U. S. fish-hatching station has been planted not far off, he gently scoops around the wharf in rude citizen's dress; but formerly he made a barbed harpoon from the leg-bone of the deer (10) and rawhide, and therewith landed the wildest salmon.

Neither ancient nor modern savage could surpass him in chipping jasper and obsidian. His *lames de silex*, whether fur-wrapped (13), hafted in wood (14), or on a long pole for fishing (15), are justly the admiration of the world. His finest weapons, however, were his bows and arrows (16). The bow is of yew or cedar, and so deftly backed with a mixture of shredded deer-sinew and fish-glue that the uninitiated mistake the backing for a tough bark. His arrow consists of the following parts: shaft of willow or other soft wood; foreshaft of hard wood, inserted in the pith of the shaft and seized with sinew; head of jasper or obsidian, untanged, and lashed with sinew; and the feather often laid on spirally. Add a pretty quiver of otter, fox, or wolverine skin, and the artillery is complete.

The Hupa women are among the most refined and delicate tanners, embroiderers, and basket-weavers in the world. A cloak of deerskin (19), fringed and decked with colored grass, or a skirt of pine-nuts, etc., is a most graceful drapery.

The Hupa has a kind of money (17) made by wrapping snake-skin or maiden-hair fern bark around long dentalium shells (17). He also cuts out disks from the clam or olive shells. The former money he keeps in a curious pocket-book of elkhorn hollowed out and wrapped with buck-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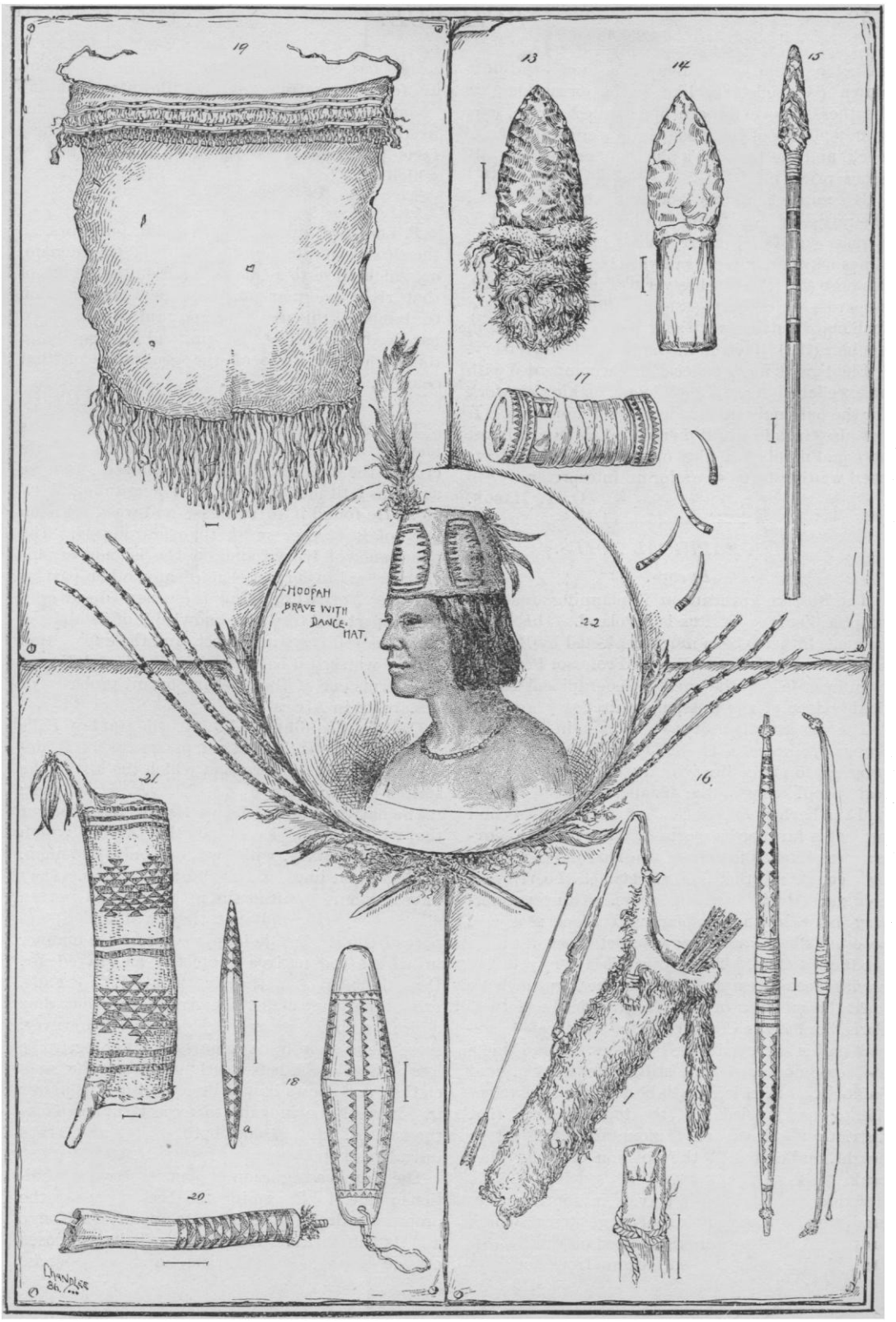
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skin: the latter he strings on a thong and rubs down on sandstone, like a Marquesas-islander. Feathers, however, are his greatest pride, and gaudy plumes of the woodpecker's crest, the duck's neck, and the blue-jay's plumage, are held at fabulous prices (22).

His music he draws from the whistle of bone, the rattle, and the drum; in his dances he carries a queer wand of basketry in his hand (21); sometimes he wears a 'spritsail yard' in the septum of his nose (20); he crushes vermin in his head with a spatula of elkhorn (18); and, finally, he has a fashion of putting very sharp pins of elkhorn in his hair (18*a*) to pierce the hand of the adversary.

Lieutenant Ray's collection is accompanied with an excellent descriptive catalogue, making his work for the national museum worthy of imitation. It has also the additional merit of explaining almost an equal number of nice old specimens that have been waiting forty years for an interpreter.

O. T. Mason.

GEOGRAPHICAL NOTES.

Europe.

The Russian government is planning an ethnographical survey of Russian Poland. This province has hitherto been much neglected by Russian scientists, and is, according to Professor Petri, not even included in the great 'Geographical statistical lexicon of the Russian empire.'

The construction of two canals in southern Russia is projected. The Duke of Leuchtenberg proposes to pierce the isthmus of Perekop. This canal would shorten the distance between Odessa and the harbors of the Gulf of Azov. The second project is far more important. The Russian government intends to connect the Don and the Volga by a canal, and the country between the rivers is being surveyed for the purpose. Thus, a waterway between the Caspian and Black seas will be established, and a new outlet opened to the produce of Asia. The project is a very old one, having been attempted by Peter the Great in 1696.

At the meeting of the Geographical society of Paris, Jan. 7, the Count of Saint-Saud gave a report on his surveys in the Pyrenees. Large tracts of these mountains are still little known, and Saint-Saud's researches will be a valuable contribution to our knowledge of the topography of that district. He discovered a mountain 9,500 feet in height, and corrected the position of some other peaks.

Feddersen, during his travels in southern Iceland, found the remains of large trees, which prove that forests formerly existed on that island. Dr. Labonne, who crossed Iceland from south to north last summer, makes a similar statement. He found some remains of willows and birches about sixteen feet below the surface, embedded in the silicious deposits of the Geyser. These facts prove the correctness of the old 'Sagas,' which refer to forests in Iceland.

Asia.

P. Lombard, missionary in Siam, publishes, in the *Missions catholiques*, a map of the Menam, on which all settlements situated on the banks of that river are marked. The new information contained in this map is important, as Lombard has lived a long time in Siam, and has acquired a thorough knowledge of the geography of that country.

Africa.

Junker's exploration of the Welle makes its identity with the Obangi very probable. He crossed the river six times, and followed its course as far as latitude 3° 13′ 10″, and longitude 22° 47′ 40″. He found it to run east and west, with no part of it farther north than latitude 4°. The abundance of ivory found on the islands of this river is said to surpass that of any other part of Africa. Notwithstanding these new discoveries in this part of Africa, our knowledge of its hydrography is still very imperfect, and the exploration of the watershed between the Shari and Kongo still forms one of the most important problems of researches in Africa.

Captain Coquilhat, who visited Stanley Falls after the Arabs had taken possession of it, describes the moral impression which the loss of the station has made upon the natives, as follows: "The natives admire the persistent resistance of the whites. The losses of the Arabs, which amounted to sixty, while we lost only two men, made a great impression upon the negroes. They have seen and felt that the white man is not an ally of the Arab, and that they will find a support in him against their oppression. The manner in which the natives protected and saved Mr. Deane, the chief of the station at Stanley Falls, proves that they detest the Arabs, and that they desire to be governed by whites." However, these views seem to be somewhat sanguine. The loss of Stanley Falls is a serious affair to the association, and shows how little established its power is. It would be in vain to expect support from the natives, who consider both whites and Arabs intruders in their country.

The Kongo association is planning two expeditions; one, to determine the best route for the proposed railroad; the other, to explore the Kongo and its tributaries. The latter will be composed of geologists, agriculturists, and commercial

agents. Mr. Delcommune, who spent ten years at the factories and stations on the Kongo, will probably be its leader.

The announcement of Dr. Holub's death is denied by the latest telegraphic news. Holub left Austria a few months ago, with his wife and a few servants, to explore the country north of the Zambezi, and some weeks ago news was received that a European was murdered thereabout. It seems that this report gave rise to the rumor of Holub's death.

America.

The Geographical society of the City of Mexico announces its intention of resuming the publication of its journal, which was discontinued in 1882.

Dr. R. Bell's report on the Alert expedition to Hudson Bay, which is contained in the last 'Annual report of the geological survey of Canada,' shows how little is known of those countries. As the object of the expedition was the relief of the meteorological stations in Hudson Strait and Bay, Bell had no opportunity of leaving the ship for any length of time. However, his observations are the only ones we have referring to this vast district, and as he has carefully availed himself of every chance the movements of the ship gave him, he offers a great deal of new material. The author, who is thoroughly acquainted with the Hudson Bay Basin, through his extensive travels and numerous researches, gives a general sketch of the distribution of strata in Hudson Bay, and makes it probable that the whole of this vast basin is composed of flat-lying paleozoic strata. His observations lead him to the conclusion that during the glacial period an enormous glacier filled Hudson Strait, and flowed east towards the Atlantic Ocean. A southern branch seems to have come from Ungava Bay. It is very desirable that a geographical expedition to Hudson Bay be organized, as the coast is only known in its general outlines, and no scientist has ever set his foot on the greater part of these districts. Since Fox's journey to Fox Channel, only a few whalers have entered this strait; and the coasts, which are within easy reach from our harbors, and are of considerable importance on account of the whale, walrus, and seal fisheries, have never been explored.

Australasia.

The New-Guinea company's steamer Ottilie has ascended Augusta River, in the German part of New Guinea. It was found navigable for a considerable distance. Having sailed three days, the water was found to be too shallow to continue the journey in the steamer, which drew eleven feet of water. The party ascended the river two and a half days farther in a steam launch, and returned only on account of the want of provisions. Measuring on a straight line, their farthest point was 156 nautical miles distant from the mouth of the river, and 74 miles from the north shore of the island. The existence of a navigable river of this size will be important for the development of the colony.

NOTES AND NEWS.

THE fourth annual catalogue of the Chicago manual training school is very encouraging. Although the regular school exercises were only begun in February, 1884, the total number of pupils enrolled is now 190. The course is a three years' one, and embraces instruction in mathematics, science, language, drawing, and shop-work, during the entire period. The requisites for admission are, that the candidate be at least fourteen years of age, and be able to pass a satisfactory examination in reading, spelling, writing, geography, English composition, and arithmetic. The school has a well-equipped wood-room, foundry, forge-room, and machine-shop, and ample apparatus for teaching the various subjects in which instruction is given. Under the efficient direction of Dr. Belfield, the successful future of this institution is assured.

— Perhaps no university chair in the world has had such a succession of distinguished occupants as has the Smith professorship of the French and Spanish languages and belles-lettres at Harvard. The professorship was established seventy years ago, and George Ticknor held it for nineteen years. His successor was Henry Wadsworth Longfellow, who held it for eighteen years; and James Russell Lowell, who has just resigned, held it for thirty-one years.

— In an account in *Modern language notes* for February, Mr. Calvin Thomas says that of the 176 names of those in attendance at the recent convention of the Modern language association at Baltimore, seventy per cent appeared to be English or American, and twenty per cent were obviously German. Of the total number in attendance, seventy-eight were teachers engaged in modern language work, and of this last number, sixty-five were engaged at colleges and universities. These sixty-five came from eighteen different states, as follows: from Maryland, 11; Massachusetts, 8; Pennsylvania, 8; Virginia, 6; Ohio, 4; South Carolina, 4; New Jersey, 4; New York, 3; Rhode Island, 3; Connecticut, 3; Indiana, 3; Michigan, 2; Kentucky, Louisiana, Delaware, Illinois, Tennessee, and Nebraska, each 1. These figures afford at least a rough criterion as to how far the

association has come to be truly representative of America.

— Professor Conrad of Halle has an article in the *Allgemeine zeitung* of Jan. 4, criticising the system of giving stipends to students, which now prevails at the German universities.

— *Nature* prints an account of a meeting, lately held, of the Association for promoting a teaching university for London, at which the second report of a sub-committee on the subject was received. At a meeting held in December, 1885, the committee were instructed to open communications with the governing bodies of the University of London, University college, King's college, the Royal college of physicians of London, the Royal college of surgeons of England, and the various medical schools of London, as well as with the council of legal education, for the purpose of promoting the objects of the association on the basis of that report. The committee have been informed by the senate of the University of London, and by the councils of University college and King's college, that committees of those bodies had been appointed to consider the objects and proposals of the association. The council of King's college have adopted a resolution to the effect that "the council, while reserving their opinion as to the details of the scheme laid before them by your committee, approve generally of the objects which the association has in view." The subject having been brought before the council of University college, they adopted a resolution to the following effect: "That this council do express a general approval of the objects of the association, which are as follows: 1°, the organization of university teaching in and for London, in the form of a teaching university, with faculties of arts, science, medicine, and laws; 2°, the association of university examination with university teaching, and direction of both by the same authorities; 3°, the conferring of a substantive voice in the government of the university upon those engaged in the work of university teaching and examination; 4°, existing institutions in London, of university rank, not to be abolished or ignored, but to be taken as the bases or component parts of the university, and either partially or completely incorporated, with the minimum of internal change; 5°, an alliance to be established between the university and the professional corporations, the council of legal education as representing the Inns of Court, and the Royal colleges of physicians and of surgeons of London." A conference between the deputation of the committee named in that behalf and the committee of the senate of the University of London was held on Nov. 23 at the University of London; and, at the conclusion of a long and important discussion, the vice-chancellor gave to the deputation the assurance that the general disposition of those present was to move in the direction indicated by the association. Various other institutions have virtually expressed approval of the object of the association, and, while awaiting some further communication from the senate of the University of London, which it is understood will be made, either to them, or in an independent way to the university teachers of London, the committee propose to take steps for bringing to the notice of her Majesty's government the need which exists for the co-operation of the government in order to promote university teaching in London.

— Professor Hunt of Princeton has in course of preparation a book entitled 'English prose and prose writers,' which will be published in the spring. It is intended to be a text-book for advanced instruction in English prose style.

— It is reported by the *Athenaeum* that, on the advice of Dr. W. Wright of Cambridge, and Prof. D. H. Müller of Vienna, the Oriental congress at Stockholm, and also the adjudication of the King of Sweden's two prize essays, are put off to 1890.

— The *Athenaeum* is authority for the statement that the Prince of Wales has undertaken, at an early date, to open the new buildings of the College of preceptors in Bloomsbury Square, recently erected at a cost of over £16,000. The council hopes, in its new quarters, to carry on with increased efficiency the manifold work of the institution, the importance of which may be measured by the fact that more than fifteen thousand pupils, representing nearly four thousand schools, were examined by the college during the past twelve months. The council also proposes to start a fund for the purpose of establishing a training college, or of promoting some other scheme for the training of teachers; and in the mean time it is intended to set apart £300 a year, to be awarded in the shape of scholarships for intending teachers.

— The paper on 'The mutual relations of the colleges and academies' read before the convention of the University of the state of New York, in July last, by Professor Hewett of Cornell university, has been issued in pamphlet form.

— The returns from the University of Berlin this winter show an unexampled activity. The total number of students is 5,357, the largest ever reached at a German university. Of these,

794 are matriculated in the faculty of theology, 1,282 in the faculty of law, 1,297 in the faculty of medicine, and 1,984 in the faculty of philosophy: 4,062 of the students are from Prussia; while the rest of Germany furnishes 740. The foreign students number 381, the Russians coming first with 198, America following with 149. In the faculty of philosophy are 715 students from gymnasia, and 402 from real-gymnasia. The total number of instructors is now 288, including 16 in theology, 22 in law, 103 in medicine, and 147 in philosophy.

— M. Justi, who has received a flattering call to the University of Vienna, will not leave his chair of the history of art at Bonn.

— The *Pacific science monthly*, edited by Rev. Stephen Bowers, is to be issued as a bulletin of the Ventura society of natural history in the future, and published quarterly or as occasion demands.

— E. L. Greene, who has made a name for himself by his 'Studies of the botany of California and parts adjacent,' has been lately appointed a professor in the University of California.

— The March number of the *Popular science monthly* will contain a portrait of the late Prof. E. L. Youmans, engraved on steel by Schlecht. The likeness is considered remarkably vivid, while the execution of the work is much superior to ordinary book-plates.

— Henry Hemphill, the renowned brick-layer and conchologist, has presented a collection of a thousand species of shells to the San Diego society of natural history. A few years ago he gave the State normal school a series of over eight hundred mollusks, collected by himself in the west part of the United States, which was by far the best public collection on the coast.

— In the Clarendon press series of school and college text-books, three new volumes have recently appeared. Professor Sweet's 'Second middle English primer' is meant as a continuation of his 'First middle English primer,' and consists of a series of selections from Chaucer, together with a brief grammatical outline and a key to phonetic transcription. Mr. Sloman's edition of the 'Adelphi' of Terence is excellent as an elementary book, and the worst that can be said of Heberden's edition of the 'Medea' is, that it contains nothing new.

— Hungary has within its borders 143 towns, in 74 of which the Magyar element predominates, in 24 the German, in 24 the Slavic, in 6 the Roumanian, and in one each the Servian and Bulgarian. Thirteen towns are not marked by the distinct preponderance of any nationality.

— The population of Africa is estimated at two hundred millions, of whom forty per cent are negroes, and forty per cent Hottentots and Bushmen.

— The educational bureau, or museum, and the pedagogical library that Superintendent Draper is building up in conection with his department at Albany, deserve encouragement. The collections will not only be valuable in themselves, but they should be the source of inspiration and suggestion to numbers of teachers.

— The geological survey is receiving data daily concerning the recent earthquake of Feb. 6 in southern Indiana, Illinois, a small portion of Kentucky, and east central Missouri. The only accurate time-observation was that made at Terre Haute, Ind., by Prof. T. C. Mendenhall, who gives the time as 4:15:06 A.M., Feb. 6. The newspaper reports indicate an area of about 75,000 square miles in the states just given. The greatest intensity was in south-western Indiana and south-eastern Illinois. Efforts are being made to obtain the accurate boundary of the area covered, by means of circulars sent out by the geological survey.

— Mr. Carlisle Terry, one of the most efficient officers of the coast survey, who has been in charge of the magnetic observatory at Los Angeles, has been compelled, on account of ill health, to retire temporarily from the service, and has been ordered to his home at Columbus, Ga. The results of Mr. Terry's thorough work have been most important, and his services will be greatly missed.

— Among the reported discoveries for the prevention of rabies is that of Dr. Fernandez of Barcelona, who claims that a dog that has been bitten by a viper never has rabies, and cannot become rabid when inoculated. He has inoculated dogs with viper's poison, and he holds that under no circumstances will they ever become rabid.

— An automatic collecting or toll-taking device, to be attached to telephones at public or pay stations, has been invented. The mechanism in the telephone-box is so arranged that the telephone will not operate until a coin of a certain size and weight, dropped into a slit in the front, acts upon a switch-lever, thereby making electrical connection between the transmitter and the line wire. The act of hanging the receiving-telephone, after use, in the place provided for it, drops the coin into a till and releases the switch-lever, thereby breaking the electrical connection and 'setting the trap' for the next user.

— Captain Gates of the ship L. Schapp has reported to the U. S. hydrographic office that on April 19, when off Cape Horn, on a voyage from San Francisco to Liverpool, the temperature of the water suddenly rose from 42° to 44°. Judging from this that the vessel was too close inshore, he hauled off three points, and, after standing on this course for four hours, the temperature fell to 42°. The captain stated that on a previous voyage he had noticed this warm belt, and judges that it does not extend more than ten miles offshore. He believes he would have gone ashore if he had continued on his first course half an hour longer. He had not seen the sun for twelve days.

— The longest completed tunnel in the world is at Schemnitz in Hungary. It is 10.27 miles in length, with a cross-section of 9 feet 10 inches by 5 feet 3 inches, and is used for drainage purposes. The new Croton aqueduct tunnel, now in course of excavation near this city, will be much the longest tunnel in the world. When completed, it will be nearly 30 miles long, with a section much larger than that of the Schemnitz tunnel, being about 16 feet in diameter. Twenty-two miles have already been excavated.

— The International statistical institute will hold a meeting in Rome early in April.

LETTERS TO THE EDITOR.

***Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The natural method of teaching languages.

WILL you permit me to call attention to two misstatements in Mr. Stern's article on 'The natural method of teaching languages,' which appears in *Science* of Jan. 21? On p. 69 he says, "Why is it that the old method . . . could be shaken in its very foundation to such a degree that one of its warmest defenders writes but lately, 'It is evident to me that the old grammatical method cannot survive the assault of the natural method'?" The writer referred to as 'one of the warmest defenders' of the old method has been conspicuous and outspoken in discarding 'the old method,' both in theory and practice, for many years, and, had his name been quoted, the absurdity of the above would have been at once apparent.

Farther on, Mr. Stern says, "It would seem strange . . . that an educational journal which is not friendly [*sic*] inclined towards the method should have recently been forced to admit that 'the subject is now attracting great attention in the secondary and higher schools.'" The expression 'forced to admit' is misleading. Possibly it was intended to be so. It would be interesting to learn the exact nature of the *forcing*. By the same token it might be claimed that any statement of fact is a forced admission. It was simply given as an excuse for introducing the matter as the subject of *Interchange*. Perhaps Mr. Stern would claim that our statement that "there are twenty thousand secondary teachers in the United States" was a forced admission, but we have never so regarded it.

THE EDITOR OF THE ACADEMY.

Syracuse, N.Y., Jan. 22.

The submerged trees of the Columbia River.

The phenomena which Capt. C. E. Dutton has so well described under the above heading in No. 208 of *Science* were observed by me in the autumn of 1870, when, in the course of preparations for a topographical and geological survey of Mount Rainier, I made a trip from Portland to the Dalles and back, and later, on my return from Mount Rainier *via* the Dalles to Portland, during the month of November of the same year. The submerged trees excited my vivid interest during these trips up and down the river; and during an enforced stay at the Cascades on one of these occasions, I made some investigations in the vicinity, which, with information I obtained from old Hudson Bay trappers and Indians, suggested to me an explanation of the backing-up of the river different from that offered by Captain Dutton. This explanation, which was embodied in a somewhat popular address delivered by me before the American geographical society in New York on March 13, 1887 (Bulletin No. 4, session 1876–77, p. 11), I venture to repeat here, for the reason that Captain Dutton assures me that he had not known of my publication on the subject, and that the explanation had not been suggested to him at the time of his investigations. It is briefly this: —

1. The valley of the Columbia River at the Cascades is a cut, considerably broader than the actual stream-bed, through over 3,000 feet of beds of basalt and basaltic breccia, which here form the axis of the Cascade range, and which rest on a loosely aggregated bed of conglomerate carrying leaf-remains and trunks of trees, sometimes petrified, sometimes merely carbonized, apparently of miocene age. This bed of conglomerate is seen to outcrop about at the river-level at the foot of the Cascades: therefore in its cutting-down or corrasion the Columbia River had already reached this conglomerate bed below the falls, and above was within thirty feet of it.

2. The river at the Cascades is a narrow boiling stream, rushing down over immense broken masses of basalt, and between steeply cut banks of basalt; which banks are, if I recollect rightly, somewhat higher than the broad forest-covered stretches of the valley which extend on either side of the stream to the base of the steep bounding cliffs. In this stretch on the north bank I observed an old stream-bed filled with rounded pebbles, through which at least a part of the stream once ran.

3. The Indian tradition above referred to says that there once existed a natural bridge at the Cascades, and that the ancestors of the present tribes (probably at no very distant period) used to cross the river here dry-shod. The form of the banks at the head of the stream lends probability to the truth of this tradition, for they appear like the rude abutments of such a bridge, which had been left after its destruction.

4. The submerged stumps of trees which line irregularly the banks of the river above the Cascades are of the same species, and generally about the same size, as the older of those which clothe the steep

slopes of the valley on either side from the water-line upwards. Their submergence is evidently, therefore, a matter of quite recent date, even historically speaking.

From the above facts and traditions I reconstructed the history of the formation of the cascades, the damming and backing up of the stream above, and the consequent submergence and killing of the trees which grew immediately along its bank, as follows: —

At the time when the general cutting of the Columbia valley had reached about the level of the present flood-plain at the Cascades, through some crack or other natural opening its waters found a passage into the underlying conglomerate bed, which, being permeable, allowed a passage of this water down stream to a point in the bed itself where it outcropped at or above the level of the lower part of the stream. Such a passage, once established, would be rapidly enlarged by the force of such an overlying mass of water as the Columbia River; and to those familiar with the corrading force of water, as shown in the stream-action of western rivers, it must readily be apparent that it would soon become large enough to take in the whole stream; that thus for a certain distance the whole Columbia would run underground, like the so-called 'Lost Rivers,' which are still found under the basalt flows of the Snake River plains. Thus would have been formed the natural bridge spoken of by the Indians. Moreover, by this lowering of its bed at this point, the bed of the river above would have been correspondingly lowered, and tree-growth would have gradually extended down to the water's edge, as it does at present.

Meantime the corrasion of this underground stream would gradually wear away the supports of the overhanging sheet of basalt, until at length they became inadequate to hold it up; and when they fell, the underground passage would have been suddenly filled, the river dammed up to the present level, and the stream also backed up so as to cover the roots of and thereby kill the trees along the lower part of its banks. Such is essentially the present condition of the stream: for the broken masses of the basalt which form the present stream-bed at the Cascades resist the wearing-away of the water better than did the conglomerate, and the river above the Cascades still stands at a higher level than it did before the falling-in of the basalt bridge.

I must admit the possibility that an actual survey of the region about the Cascades might disclose facts that would make the above explanation inadmissible, since it is founded on a very hasty and superficial examination. In spite of the fact of Captain Dutton's later and possibly more thorough examination than my own (for I have not been there since 1870), I am not quite willing to yield my theory in favor of his, for the reason that his theory involves what seems to me a geological improbability, — one which, in my experience at least, has not been supported by any observed facts. This is, that an earth movement — for such the flat anticlinal arch he assumes to account for the raising of the old flood-plain below the Cascades involves — could have proceeded more rapidly than the corrasion of as large a stream as the Columbia, so as to actually dam it up, and then have conveniently stopped, so as to allow corrasion to gain its former ascendency over the earth-movement.

S. F. EMMONS.

Washington, Feb. 8.

A carnivorous antelope.

A few months ago, while visiting a friend on a cattle-ranch in the San Andreas Mountains of southern New Mexica, I saw what to me seemed a most abnormal habit. My friend had a young antelope six or seven months old, which he had captured when very young, and kept as a pet about the ranch. This animal is, by the way, very tame, following its master about without once offering to join its fellows, which often come in sight of the house. When offered pieces of raw beef, it will eat the meat with evident relish, and in preference to vegetable food. I have seen it eat piece after piece until it has disposed of half a pound or more, then it would walk to the corn-crib and eat corn as a sort of dessert. It also eats bread, cooked potato, and sweet-potato both raw and cooked.

RALPH S. TARR.

Cambridge, Feb. 14.

Language-teaching.

The important subject of the teaching of modern languages having been discussed in the columns of *Science*, and no definite plans having been offered by either of the writers discussing it, perhaps the original and independent views of a practical teacher will not be unwelcome.

It is obvious that a complete knowledge of a language consists, 1°, in having full command over the bodily organs through which it is either received or communicated to others, — viz, the vocal organs, ears, and eyes, — so as to be able to utter any sound like a native, to understand all that he says, and to read any book aloud in the proper manner; 2°, in mastering those fundamental rules of grammar — including those of the verbs — indispensable in order to speak and write correctly; 3°, in the possession of a fund of words and idiomatic forms for the expression of ideas; and, 4°, in the power of using these words and forms according to the special genius of the language studied.

Sounds of the human voice are the vibrations of an expired current of air, produced by the vocal organs, which (in the case of the French pronunciation) are, for the formation of every sound, in a fixed and determined position. In my book on pronunciation, 'French orthoepy,' I have indicated the relative positions of the vocal muscles for every French articulation and vowel. The learner is trained, by means of different vocal exercises, to use the instrument of speech in exactly the same manner as the natives; and, employing the same means, he must necessarily obtain the same result. These gymnastics of the voice are accomplished in a few short hours, and are an indispensable preliminary exercise before commencing the study proper of the language.

Teaching a language without the few fundamental rules that regulate it, including those of the verbs, is depriving the student of a most valuable aid and guide; while making grammar the all-important subject, especially in the beginning, is to create a confusion in his mind, and to impede his progress. I have taken a middle course; and in my grammar will be found, in a concise form, only those general rules without which nobody can either speak or write properly. My grammatical exercises have been framed with the view of initiating the learner into the idioms and construction of the language. To avoid those disconnected and commonplace phrases

generally found in French grammars, I have treated, in each of those exercises, one special subject.

I have made a synoptic table of thirteen lines, by which all verbs, regular or irregular, are conjugated, thus saving the student the monotony and annoyance of studying the verbs from memory by a new combination and arrangement. The student is thereby saved loss of time in writing endless conjugations of verbs.

To make attractive and instructive a study which is too often wearisome and sterile, I have given, in the third volume of my series, a vocabulary, divided into chapters, each containing an interesting outline of stories bearing on a special subject, and comprising a list of the most useful and important words of the language in daily use. Thus a natural chain of ideas is formed, easily remembered, and which can be made the subject of a conversation and composition, the student gaining in this way a thorough knowledge of the practical framework of the language. As soon as the student knows a few words of the vocabulary, these outlines are made the subjects of conversations between teacher and pupils, and, later on, between the pupils themselves. They are also employed in the form of narratives, by joining them together; and, by degrees, they are enlarged upon more and more. The fourth volume of my series, 'The modern French method,' comprises a series of words, idioms, and proverbs, forming skeleton narratives of travel, incident, and scenes, — romantic, dramatic, and comic, — all fitted to elevate the mind and inspire noble thoughts: there are also sketches in geography, biography, and history to be used in conversation and composition. By the study of this work, the learner acquires the framework, words, and idioms for literary style; and as every word, idiom, and proverb is properly located, the student will comprehend all their bearings by the context, and will know how to use them in their full meaning. A vast number of idiomatic questions are put upon the above-mentioned outline, and the answers are furnished by the student from the skeleton, or framework, upon which he enlarges at will. In order that the learner should acquire self-reliance, and be able to express himself freely on literary subjects, and should get an elegant style of his own, he sets down in narrative form each lesson previously treated conversationally, by which means he can give free play to his imaginative faculties.

The pupil, being constantly imbued with French ideas, and accustomed to look at things from a French point of view, adapts himself to them, and necessarily expands his mental vision: and as a great number of the subjects he treats of arouse his moral sensibility, and are fitted to excite in his heart tender compassion, brotherly love, devotion to his fellows, and self-denial, his moral capacities must be, as a matter of course, enlarged. This method is easy and simple, interesting, natural, and practical; and it relieves the student from much irksome and monotonous labor. It trains the ear to the apprehension of the spoken language, and, by a systematic training of the vocal organs, gives to the speaker a faultless Parisian pronunciation. The pupil is presented with a vocabulary so constructed that all the words, idioms, and proverbs form an intelligible outline of scenes and sketches, which the mind grasps and retains, while bringing out fully their individual and conventional meanings. The pictures are made so vivid and obvious, and the words are so suggestive, that the memory is greatly assisted, and the aquirement of a stock of words becomes a mere pastime. These words are fixed in the mind of the student by frequent and pleasant repetition, and thus memory is cultivated without straining; while, by means of idiomatic questions, educing appropriate answers, the learner is made acquainted with the peculiar genius of the French language. No English is either written or uttered during the course. The pupil finds in the book ample English explanations, and is never left in the dark; yet by degrees he becomes accustomed to think in French.

Joseph D. Gaillard.

New York, Feb. 11.

Inertia-force.

In *Science* of Feb. 11 Professor MacGregor has very courteously criticised my use of the idea which I have sought to express by the term 'inertia-force' in a pamphlet recently published. Professor MacGregor misunderstands me, however — or I misunderstand him. He quotes from my pamphlet the following passage: "If one of the opposing applied forces is greater than the other, the greater will prevail, and a change of motion will occur, occasioning an inertia-force, which will work *with* the smaller applied force *against* the greater," and then says, "The inertia-force, therefore, is supposed to act on the body by which it is exerted."

I am at a loss to understand how Professor MacGregor makes this inference from the passage he quotes. I meant that the inertia-force works ('acts' would be a better word) with the smaller applied force *against the agent which* exerts the greater force. Take this example: a train is being started by a locomotive. The forces *applied* to the train are the pull of the locomotive, and the smaller, opposing, force of friction. The pull of the locomotive prevails, but in prevailing it must deal not only with the resistance due to friction, but with the reaction (which also I call resistance) due to the inertia of the train. The friction resistance would be nearly the same whether the acceleration of the train were great or small; but the resistance due to inertia, the *inertia-resistance*, or *inertia-force*, would be always proportional to the acceleration.

The term 'centrifugal force,' although I do not like it, does not excite in me the horror which Professor MacGregor evidently thinks it should occasion. I certainly should not say that a ball swinging in a circle at the end of a string connecting it with the centre of the circle is *acted on* by 'a force directed from the centre,' but I certainly should say that the ball *acts upon the string* with 'a force directed from the centre,' — a proposition which seems to me so plainly true that I think all difference of opinion as to its truth must arise from different interpretations of the word 'force.'

I suspect that Professor MacGregor and I do interpret that word somewhat differently. The following quotation from Maxwell's 'Matter and motion,' p. 78, seems to me to express my view with sufficient accuracy: —

"As soon as we have formed for ourselves the idea of a stress, such as the tension of a rope or the pressure between two bodies, and have recognized its double aspect as it affects the two portions of matter between which it acts, the third law of motion is seen to be equivalent to the statement that all force is of the nature of stress, that stress exists

only between two portions of matter, and that its effects on these portions of matter (measured by the momentum generated in a given time) are equal and opposite. *The stress is measured numerically by the force exerted on either of the two portions of matter*" (the italics are mine).

In making this quotation, as in making other quotations from the same authority in my pamphlet, I appeal from Maxwell the critic to Maxwell the author. The passage just quoted meets so many of the points raised by Professor MacGregor, that I shall trench upon your space no further now, except to thank Professor MacGregor for his general commendation of my pamphlet, and to say that I made my quotation from Minchin, not to suport my use of the term 'inertia force,' but because of its recognition of what Minchin there calls the 'kick' of a body 'against change of motion.' E. H. HALL.

Cambridge, Mass., Feb. 13.

German constructions.

Permit me a few words apropos of the various letters called forth by my remarks about German scientific writings. To Mr. Eggert, who found fault with me so abundantly, there was no possibility of reply, as his motives were emotional, and criticism has nothing to take from emotion except sympathy to understand. Mr. Eggert wrote, "'M' assumes to judge of the literary qualifications of people who use a language with which he himself is less familiar than he is with French and English." I regret that he made this erroneous statement. But experience has shown, that, when people express opinions on subjects they know nothing about, they are not unapt to make serious mistakes, and so Mr. Eggert has blundered about my knowledge of languages.

In regard to Mr. Lea's sentence with the six pronouns in execrable succession: is it much worse than the following sample of what is grammatically good English?—"He said *that that that that that* man used was incorrect."

Mr. Frazer gives a sentence, which he kindly admits to be obscure, although it follows upon the expression of his admiration of the lucidity of that kind of *emboîtement* phraseology. He admires even this sentence, Dem, der den, der die, das Verbot enthaltende Tafel abgerissen hat, anzeigt, wird hierdurch eine Belohnung zugesichert, — "because it says in eighteen words and ninety-five letters what *cannot* [*sic!*] be literally translated into English in less than nineteen words and one hundred and four letters." A very small difference! Suppose one exclaims 'tram' 'Pferdebahnwagen,' — one word and four letters, and one word and fifteen letters; or 'woodmaster' and 'Holzversorgungsinspector.' In Austria the full title of the official is kaiserlich-königlich-Staatseisenbahnholzversorgungsinspector. Such petty comparisons are, of course, only *jeux-d'esprit*, and have little argumentative value.

To return: the English of Mr. Frazer's perspicacious phrase might be; in strictly literal translation: "A reward is hereby promised to whomever tells who removed the warning sign," — thirteen words and sixty-two letters; or if we put, as would be natural in English, 'notice' instead of 'warning sign,' twelve words and fifty-seven letters. There is some difficulty, as there is no exact equivalent for *Verbot*. In English, 'die das Verbot enthaltende Tafel' might well be 'notice to trespassers,' or something of the kind. It would be interesting to known what Mr. Frazer's lengthy translation was: it can hardly have been any thing but a ludicrous rendering of word for word, and not real English at all, either in spirit or construction. The example will serve my purpose: German permits very lengthy and involved sentences, — I think of my friend, a distinguished professor, who rejoiced that the twelfth part of a work on mineralogy had come; it completed, he said, the first volume, and he hoped to find the verb in the second! — a mere droll exaggeration. But what must be the possibilities of a language when such a joke about it makes one laugh? The gist of the whole matter is, that a great many German writers do display the bad possibilities of their tongue; and when Mr. Frazer says that the *best* writers seldom or never use the involved sentences, he makes an implication about the good and mediocre writers which shows that he agrees in reality with the general opinion that German authors have too frequently a faulty and obscure style. I commend to his notice Matthew Arnold's criticisms on the Germans, or Rivarol's. M.

Boston, Feb. 10.

On certain electrical phenomena.

At one time it was very hard for me to believe, indeed, that any person living possessed such a power as being able to shuffle across the carpet of a room, and light the gas as it issued from the jet of the burner, by simply touching it with the tip of the finger. I have at present, however, two friends, at least, among my acquaintances, who seem to be capable of performing this feat at all times, and under any circumstances. Now, I find similar phenomena exhibited to a very high degree in my own person, at Fort Wingate here. This point is over 6,000 feet above sea-level; the only water in the neighborhood is a small pond — a puddle, really — and a few insignificant springs. The air is usually clear, and highly rarified; indeed, all the conditions seem to be favorable to the exhibition of electrical appearances.

Only the other day, while pacing my room, passing, as I did so, each time, over a large woollen Navajo blanket that lay spread out on the floor, a circumstance arose which called upon me to touch the cast-iron urn that ornamented the top of a small wood-stove in the apartment, and which had a fire in it at the time. Before the tip of my index finger touched it, by a distance of fully a centimetre, there was displayed in the intervening space a brilliant electric flash, accompanied by a report that could be distinctly heard in the adjoining room above ordinary conversation. The experiment was repeated three or four times, but the display became more and more feeble with each trial; it regained its original force, however, after I paced across the blanket on the floor a few times. Additional experimentation went to show that this electrical discharge was considerably greater from the tip of the index finger than from any of the others of the hand, and gradually diminished in regular order as we proceeded to the little finger; and, further, it seemed in my case, more evident in the left index rather than in the right one. When all ten finger-tips were drawn together and then brought up to within a centimetre's distance of this stove-urn, the flash and report appeared no greater than it did from the index finger alone.

At times, apparently depending upon the meteorological conditions, my entire system seems to become thoroughly charged with this animal electricity, and most small objects crackle and snap as I handle them, leaving, as night draws near, an uncomfortable, aching sensation in my arm, and extending more or less down my side. During these same times, should my wife take any small object from my hand (as a draughting-pen, or the sponge-glass upon which such a pen is cleansed) an electrical report follows the contact, that can be distinctly heard throughout a large room. On the other hand, I had occasion to examine an injury of the back in a young mulatto girl of about fifteen years of age, a few days ago, when, with my right hand resting upon her shoulder, and my left making the required examination, there instantly followed for me a sense of the most profound relief, as if it were that all the electricity in my system had been completely withdrawn by the act. This girl, during a stay of nearly three years at Fort Wingate, has never been conscious of any electrical phenomena associated with herself, similar to those which I have experienced. Previous to coming here, I had resided about a year in Washington, where I had never observed such exhibitions, so far as my own person was concerned, and they only gradually developed at this place.

I write a great deal, sometimes six and eight hours consecutively, and I find the only kind of pen-holder that I can use with comfort is a rubber one, and even then the constant passage of the electricity is exceedingly exhausting during the most of the time. Late the other evening, having written about eight hours during the day, I threw myself upon a thick, woolen Navajo blanket which covered an iron-frame bed in my study. I was tired and nervous, and having lain there about half an hour I arose suddenly, and, being a little dazed and drowsy, I seized hold of the iron frame of the bed to steady myself: the act was followed by an electrical shock that nearly threw me to the floor, but it was not accompanied by any audible report.

R. W. SHUFELDT.

Fort Wingate, New Mexico, Feb. 8.

Osteological notes.

In passing through the exhibition-rooms of the Museum of comparative zoölogy not long since, my attention was called to the fact that the skeleton of the Bison bonasus presented a rudimentary second metacarpal, while the Bison americanus at its side exhibited the customary fifth metacarpal; in other words, that the single splint-bone which was present on each skeleton occupied exactly opposite positions, that of the American bison being on the outer, while that of the auroch was on the inner side of the limb. This singular difference I at once attributed to carelessness in the mounting of the preparation, without giving the matter further thought. The subject, however, being again incidentally brought up, I thought it worthy of investigation.

Close examination of the parts in question showed satisfactorily that they occupied their normal position, that the diarthrodial facet for the articulation of the osseous stylet was behind and to the inside of the superior extremity of the principal metacarpal, and that there was no corresponding facet upon the outside of the same bone.

In the ruminating sections of the artiodactyla, as is well known, the second and fifth metacarpals are always reduced to mere representatives of their proximal extremities, and in some cases are entirely absent, as in the giraffe, prong-buck, and in some of the antelopes, as well as in the camels. In the Cervidae the three phalanges of the second and fifth digits are present, articulated to the distal ends of their respective metacarpals, which gradually taper to a point upwards. In some species, in addition, a small fraction of the proximal extremity of the fifth metacarpal is found. In the wapiti (Cervus canadensis) the styliform rudiments of the proximal extremities of both splint-bones are present. In the Bovinae, as a general rule, it is the rudimentary proximal end of the fifth metacarpal that is exhibited. In looking over the collection of skeletons of Bison americanus in the museum, I found no exception to this condition. In the skeletons of Bos taurus, however, although the rule held the same, there were exceptions. In one case the rudimentary proximal ends of both second and fifth metacarpals were equally developed. In several others the stylet of the second was present, but relatively very diminutive. In others, in place of a distinct rudimentary ossicle, there was an ossific deposit upon the canon-bone, simulating by its shape and position the undeveloped proximal end of the second metacarpal.

The only other skeleton of Bison bonasus in this country, to my knowledge, is in the possession of the Smithsonian institution. In answer to my inquiries, Mr. True, the curator, kindly wrote as follows: "I have examined the skeleton of Bison bonasus, and find that the metacarpals of the second and fifth digits are developed about equally at the proximal end. The largest rudiment is 55 mm. long: this is on the outside of the right leg. On the left leg, however, the larger rudiment is the inner one."

Upon the skeleton in the Cambridge museum the rudimentary metacarpals of the second digit are both equally developed, and measure 67 mm. in length, while there is not a trace of the fifth.

Owen, who is the only written authority upon the anatomy of the European bison, says in his 'Anatomy of vertebrates,' "In the bison the bones of the spurious hoofs consist, in each, of the middle and distal phalanges; and there is a styliform representative of the proximal end of their respective metacarpals articulated in the fore-foot, one to the connate trapezoid, the other to the unciform and cuneiform bones."

The modifications which prevail in the construction and number of the digits of the Ungulata are in many points of view extremely interesting. The above data are too fragmentary upon which to draw conclusions, but possibly they have their value.

D. D. SLADE, M.D.

Cambridge, Mass., Feb. 7.

Respiration and pulse-rate of foreign residents.

I should be pleased to learn from your subscribers, born in England or upon the continent of Europe, whether they have observed any variation in the respiration and pulse-rate since becoming citizens of the United States. The reports, to be of any scientific value, should contain full statement of any change in occupation or manner of life, as well as difference of latitude and elevation above the sea, and the effect of such variation upon the general health.

EDWARD T. NELSON.

Delaware, O., Feb. 9.

SCIENCE.—SUPPLEMENT.

FRIDAY, FEBRUARY 18, 1887.

ASPECTS OF EDUCATION.

I. — HUMANISM.

SINCE the revival of learning, secondary education in Europe has passed through three phases, which may be conveniently called humanism, realism, and naturalism. The first is grounded upon the study of language, and especially of the two dead languages, Greek and Latin. The second is based upon the study of things instead of words, the education of the mind through the eye and the hand. Closely connected with this, is the study of those things which may be of direct influence upon and direct importance to life. The third is not, in the first instance, study at all. It is an attempt to build up the whole nature of the man; to educate, first his body, then his character, and lastly his mind. All theories of education which have taken a practical form during the last three hundred years may be ranged under one or other of these three heads. Modern education, as we know it, is an unconscious, but not the less a real, compromise between the three ends. If we consider each separately, we shall be in the best position to understand the system to which they have given rise.

It is important to remember that the reformation in Europe happened at the time when the best European intellects were directed towards the study of the classics. This was not a mere coincidence. The revival of learning, as it is called, that is, the closer and more intimate acquaintance with Greek and Latin texts, which had before been known through translations and paraphrases, was in itself the principal cause of a reformation. The critical spirit thus engendered, the dissatisfaction aroused with the teaching of the old religion, the revolt against the schoolmen, were also efficient in bringing about the reformation. The education of the middle ages was encyclopedic, in aim if not in reality. The seven-years course of study — *trivium* and *quadrivium* — was intended to comprise every thing that a man need know. Grammar taught the whole science of words, dialectics furnished a scholar with the whole armor of argument, rhetoric invested him not only with eloquence in speech but with the more graceful gifts of poetry and imagination. The science of music, the science of numbers, the power of measuring the earth and the heavens, furnished out the completely educated man. Hand-books of the middle ages intended for students cover the whole ground of human knowledge. The 'Trésor' of Brunetto Latini, the master of Dante, is divided into three books; the first book into five parts, the last two into two parts each. The first book speaks of the origin of all things. After this comes philosophy, divided into its two component parts of theory and practice. Theory has three great divisions, — theology, the knowledge of God; physics, the knowledge of the world; and mathematics, the knowledge of the four sciences which form the *quadrivium*. Practice has also three divisions, — ethics, to teach us how to govern ourselves; economics, to teach us how to govern our family and our belongings; and politics, the highest of all sciences and the most noble of human occupations, which teaches us to govern towns, kingdoms, and nations, in both peace and war. As a prelude to these nobler sciences stand the preliminary arts of grammar, dialectics, and rhetoric.

It is true that before the reformation this noble plan of education had become narrowed and formalized. The church had pressed all knowledge into its service, and no form of knowledge was highly valued which did not contribute to the service of the church. The methods of teaching became corrupted: memory was substituted for thought. There was a striking contrast between the high aims of the best part of the middle ages and the scanty attainments of its decadence: but the shell was still there, and as long as that remained, life might be poured into it.

The renaissance swept away this effort as a dream. Scholars brought face to face with Virgil and Horace, with Cicero and Plato, were so won by the charm of a new and marvellous language, that all their strength was spent in explaining and appreciating it. The literary results of the renaissance were twofold. On the one hand, it aroused the pure enjoyment of literary form and expression; on the other, by stimulating a more exact scholarship and a more minute philosophy, it urged on the human mind to inquiry and to rebellion.

Just as the stream of this revival was in full flood, the reformation came, and separated the culture of Protestants from that of the old church. We do not sufficiently realize what a wrench this was. We are so accustomed to regard Protestant-

ism as a stimulus to independence and originality of thought, that we do not consider what a loss was at first suffered by the breach with the old religion. The whole culture of the middle ages was intimately connected with the church. If we take Dante as an example, who was steeped in all the knowledge of his time, we find that, in every thing he wrote, the ecclesiastical aspect is as prominent as the poetical. There is no moment when he has not an equal right to stand among the doctors of theology and with the poets of Parnassus. Those who broke with the church of Rome had to create a culture of their own, and the culture which they created was naturally that which then prevailed in the church which they were leaving.

It was this that gave Melanchthon his importance in the reformation, and that earned for him the name of the 'teacher of Germany.' He was by nature an exact scholar. He was well read in both Greek and Latin. He may have intended to fill up the other divisions of learning, but both his taste and his powers led him to confine himself to those departments in which he excelled. He said to his school-boys, 'Whatever you wish to learn, learn grammar first.' He recommended the study of Cicero, Livy, Virgil, Ovid, and Quintilian, and among Greek writers, Homer, Herodotus, Demosthenes, and Lucian. He recommended the writing of Latin letters and Latin verses, with Latin speeches and themes for the more advanced students.

Melanchthon might have intended, if life lasted, to deal successively with other branches of the mediaeval curriculum, but his own tastes and the success of his first efforts determined his whole career. He made the study of language in all its branches current coin for Protestants, but here he stopped.

Whatever may have been the influence of Melanchthon on Protestant schools, there is no doubt that they received their form from John Sturm of Strasburg, who was rector of Strasburg high school for forty-five years, from 1538 to 1583. We find his name in the pages of Ascham, and it is very probable that his plan of study formed the model on which the new college of Westminster was organized, but his influence extended not only to England but to all Protestant countries. He was a politician as well as a school-master; and was in constant correspondence with the leaders of the Protestant party all over Europe. His great powers were devoted to an elaborate plan for teaching the Latin language, in all its extent and in its fullest elegance, to school-boys. We have a complete account of the organization of his school, and there is this remarkable fact about it,—the boys were not only made to proceed from step to step towards final excellence, but they were strictly prohibited from taking more than one step at a time. In the examinations which were held at the close of each year, it was not only a crime to have omitted to learn the set subjects for that period, but it was as great a crime to have learned more than had been set. Not only was the human mind tied and bound within the limits of a curriculum, but individual minds were prohibited from outstepping the limits of that curriculum in any particular. Sturm must be regarded, more than any one else, as the creator for Protestants of the classical system of English public-school education as it is remembered by many who are still living. In this system, boys began to learn the Latin grammar before they learned English grammar; they were set to do Latin verses before they could write Latin prose. The Latin taught was not the masculine language of Lucretius and Cæsar, but the ornate and artificial diction of Horace and Virgil, and, above all, of Cicero. There is no doubt that this system, narrow and faulty as it was, gave a good education, so long as people believed in it. To know Horace and Virgil by heart became the first duty of an English gentleman. Speeches in parliament were considered incomplete if they did not contain at least one Latin quotation. A false quantity was held to be a greater crime than a slip in logical argument. Cicero not only influenced the education of English statesmen, but had no inconsiderable effect upon their conduct. The vanity of self-inspection, the continual reference to what is dignified and becoming, coupled with a high-minded devotion to duty and a strong if somewhat romantic patriotism, distinguished English statesmen in the eighteenth century as much as they distinguished the great orator of Rome.

There is, indeed, much to be said for humanistic training as a discipline of the mind. It is true that it deals only with words, and its highest efforts are, to decide what expression is absolutely best under certain circumstances. It is no light thing to render an English sentence, ornate and idiomatic, into a Latin sentence which exactly represents its meaning and which is equally ornate and idiomatic. It is difficult to analyze the subtle tact by which a scholar decides a particular reading in a particular passage to be right and all other readings to be wrong, or by which he determines one Latin or Greek verse to be so decidedly superior to another, that their comparative merit admits of no argument or hesitation. Any number of competently trained scholars would agree together in a matter of this kind, and yet it is entirely beyond argument that not one of them, if cross-examined

in a witness-box, could give reasons for his judgment which would satisfy a jury. The question is determined by the most delicate weighing of probabilities, by a subtle tact similar to that by which the most complicated operation of an artificer is carried on. Is not this the very process which we have to apply to the most difficult problems of life? The organon of mathematical reasoning is a far clumsier and blunter instrument than the organon by which humanistic difficulties are decided, while the organon of scientific reasoning is clumsier and blunter still. Mathematics deals for the most part with things which can be accurately apprehended by the mind. It aims, more than anything else, at exactness, and although in its higher branches it admits hypotheses of probability, yet its principal object is certainty. Science goes farther than this; it not only admits certainty of apprehension, but it claims that it should touch, see, and handle the matters with which it deals. Few results can stand this coarse analysis. If biology and chemistry refuse to acknowledge any truth which cannot be demonstrated to the senses, they put out of their reach those truths which are the most important to know, and which can be arrived at by probability alone. If methematics admits of demonstation which shall give a clear proof to any one who asks it, it removes from its sphere those judgments which rest upon the trained instinct of experts, and which can only be made clear to one who has undergone a similar training.

Regarded from this point of view, humanism was no bad preparation for active life or for devotion to any other study. It had the advantage of being small in compass, and of limits which were easily ascertained. Devotion to humanistic studies, properly understood, did not exclude application to other studies which might be considered more grave and important. William Pitt, chancellor of the exchequer at twenty-two, prime minister at twenty-four, was a first-rate humanist, as he was an excellent mathematician; but this did not prevent him from being an admirable orator, a close reasoner, a profound student of history and politics, and a political economist far in advance of his time. Much as we may regret that education in Protestant countries, especially in England, Holland, and Sweden, was narrowed by the humanistic tendency, we must not refuse to give that training all the credit which it deserves.

OSCAR BROWNING.

OF 250 railway employees examined in Budapest by Lichtenberg, 36.8 per cent were found to have impaired hearing, — a result which is certainly startling.

PUBLIC INSTRUCTION IN NEW YORK STATE IN 1886.

THE advance sheets of the annual report of the superintendent of public instruction of New York state, Andrew S. Draper, while not containing the full tables of statistics and the appendices that will accompany the full report, enable us to judge of the work of the past year.

The aggregate amount of money expended by the department during the year was $13,896,834.08, and it covers the expenses of supervision, of normal schools, teachers' institutes, Indian schools, and institutions for the deaf, dumb, and blind. It does not include the expenses of those parts of the school system that come immediately under the supervision of the regents of the university. The total number of teachers employed was 31,325, of whom 25,373 were females. The average annual salary of teachers was $701.31 in the cities, and $261.66 in the towns. The number of children of school age — between 5 and 21 years — was 1,735,073. The number who attended the public schools at some time during the year was 1,027,767; the average daily attendance was 625,813. The whole number instructed in the common schools, normal school, academies, colleges, private schools, and law and medical schools, was 1,212,327. The average number of weeks taught was, in the cities, 39.7, in the towns; 33.6.

From the data collected, it seems that fifty-nine per cent of the school population attended the public schools at some time during the year, against sixty-nine per cent in 1870. At first sight this number seems very small, but its smallness is apparent rather than real; for all persons between the ages of five and twenty-one are reckoned as of school age, and it is therefore possible for a boy to be returned as not attending school who has been fifteen years a pupil. Furthermore, it must be recollected that among the forty-one per cent of non-attending children are reckoned all these who attend private schools and academies; and in a state like New York, which contains a very large urban population, the number of pupils in private schools and academies will be very large: so the figures as to school attendance cited above, and which first meet the eye in reading the report, are misleading. In another paragraph, however, Superintendent Draper makes the direct statement that the number of pupils in the public schools, private schools, and academies, at some time during the year, was *sixty-eight* per cent of the school population.

Mr. Draper finds that the compulsory-education act of 1874 has not only been ineffectual, but that in its present form it is hardly capable of being

made to operate successfully. He says that "school trustees elected to supervise the schools, and serving without any compensation, naturally object to being turned into constables and police officers for the purpose of apprehending delinquent children or the children of delinquent parents. Moreover, the schools are full. In most of the cities, the accomodations are taxed to the utmost. Any effectual execution of the law would at once create the necessity for additional buildings in every city of the state. But, notwithstanding these considerations, the problem cannot safely be treated with indifference by the state."

The normal-school work in the state seems to be in excellent condition. There are nine normal schools, employing 128 teachers, and having a total enrolment of 5,608. While these schools are in good hands, and doing excellent work, yet they are inadequate, for as now operated they do not fill one in ten of the vacancies occurring in the ranks of the thirty thousand common-school teachers of the state. The superintendent urges that the normal schools might accomplish larger results should they spend less time in foundation work, and confine themselves to special training and practice. Moreover, some scheme should be devised to bring the normal schools to a substantial uniformity, instead of leaving them so subject to local demands and influences as they now are.

After treating of the various other subjects that have come under his supervision, Mr. Draper concludes his report with some general observations and suggestions of more than local or state application. He inquires whether, since the state of New York is now spending $14,000,000 annually in support of its public school system, it would not be a good idea to spend a few thousand dollars, once in a while, in determining how to spend this vast sum to the best advantage. "Is our education as practical as it might be? Do we reach all the children we ought? In our ardor over the high schools, which nine-tenths of our children never reach, have we not neglected the low schools? Is there not too much French, and German, and Latin, and Greek, and too little spelling, and writing, and mental arithmetic, and English grammar being taught? Have we been as ambitious of progress in the lower grades as in the advanced? Are not our courses of study too complex? Are we not undertaking to do more than we are doing well? Is not the examination business being overdone? Are we not cramming with facts, which will soon be forgotten, in order to pass examinations, rather than instilling principles which will endure? Is not our education running on the line of intellectuality alone? Are we educating the whole man? Are we not giving up moral training more than we ought, because of the danger of trenching upon sectarianism? Is there no way of adhering to the one, and avoiding the other? Are we doing what we might in the way of physical culure? Ought not the state to do something at least to encourage industrial schools? Would we not secure better schools in the country if the township was the unit of government rather than the present school district? Does not the present arrangement help the well-to-do and leave the poor to get along as best they may? Should not the law which fixes five and twenty-one years as the limits of school age be changed to six and sixteen years? Is it not time to forbid the diversion of library moneys from their legitimate uses, or to provide that they may be expended for school apparatus instead of teachers' wages? Is our system of apportioning public moneys the wisest and the best? Is there no way of specially aiding the small, remote, and poor districts? Do our different classes of educational work supplement each other and fit together so as to make a symmetrical and complete system, and do they co-operate as they might and ought?"

As Mr. Draper adds, these are live questions, and appeal to educators the world over. To answer them, he makes the suggestive recommendation that a council of say thirty eminent educators, representing college, normal school, high school, and common school alike, be called, to meet at Albany to discuss these questions and make such recommendations and suggestions concerning them as it sees fit. In New Jersey, a state council of this sort is in process of organization, in pursuance of President Meleney's recommendation, made to the state teachers at their annual association meeting in Trenton last December; but there, it is unofficial, the first move having been made by the teachers. If it is wisely constituted, it should become an educational factor of great force in the state; and if Superintendent Draper's plan is carried into effect, New York state will have a similar body of representative advisers on educational subjects.

THE TRAINING OF THE FACULTIES OF JUDGMENT AND REASONING.[1] — *II.*

I NOW proceed to show how some of our school subjects may be employed in the systematic training of the judgment and the reasoning powers. I shall follow, as nearly as possible, the order laid down in the previous article.

The lessons which I have described under these

[1] From the *Journal of education*, a paper read before the Education society, Oct. 25, 1886.

heads, when illustrating the training of the faculty of conception, will serve admirably for exercising the child in forming implicit and explicit judgments, and in making statements concerning the striking attributes of things. For material objects, chalk, salt, coal, and the common metals will afford us numerous lessons; and so will the series of inquiries into the nature, properties, and action of water, so admirably described in Huxley's 'Introductory science primer.' For form, we may use the regular solids, surfaces, and lines; while botany and natural history will provide an inexhaustible supply of lessons on life.[1] The main thing will be to make sure that the child states, in clear, unambiguous language (which he understands), only such facts as he has really observed. Classification will inevitably introduce the formation of judgments, and definition will involve the putting of them into words.[2] But better, at this stage, than classification or definition, will be a simple narrative, given by the child, of what he has seen in the above lessons, or of what has happened to him during the past week or on some specially marked occasion.

Later, propositions may be presented to the child for acceptance or rejection, those being the best which can readily be shown to be true or false. Perhaps the easiest of such propositions will concern number and magnitude. For number, the simplest problems of arithmetic are ready to hand: even such as the old catch, 'which would you rather have, six dozen dozen, or half a dozen dozen?' will be useful. For magnitude, we may take such a problem as the arranging of a number of fractions in the order of their value, or a comparison of incomes derived from investments in different stocks, every step in the proofs being clearly indicated and explained. If we desire to be more concrete, we may choose such a problem as the finding of the shortest distance between two points,—placing the two points on the blackboard and letting a piece of string hang in a loop between them, showing how it projects beyond them when pulled straight; and then beginning with it straight, and showing how its ends must approach one another in order to allow the string to hang in a loop; and so on through the many simple problems of practical geometry. But the opportunities for exercising judgments are too numerous to need particular mention. Let us only bear in mind the order of their difficulty, and very soon introduce reasoning side by side with them.

At an early stage, you will remember, the child is to be encouraged to search for causes. Here, again, a wide field lies before us. The only difficulty is what to choose. Again, our only guide is the order of nature and simplicity. The reason why fire burns the hand, or why a book, when let go, falls, is difficult and complicated. But it is simple to discover why, if I divide a sheet of paper into four equal parts and take three of them, I get the same amount as when I divide it into eight equal parts and take six of them. At a much more advanced stage, we may attempt to find the reason why, if a number is divisible by nine, the sum of its digits is also divisible by nine; while all the simpler theorems of abstract geometry will supply the young inquirer with numberless examples fairly within his power — the theorems being put in the form of questions (why is a certain fact true? or, is it true or not true?). The main difficulties about causes lie in there being more than one of them at a time at work, and in their being hard to find. At first, therefore, the cases we choose should involve only single causes, and those very evident. Later we may proceed to such lessons as those on the forms of water, in Huxley's 'Introductory primer,' which I have already referred to, and which introduce more than one cause,—change of temperature and change of pressure, for instance, in the cases of evaporation and condensation. But even here we may make things much simpler by taking one agent at a time and noting its effect, instead of seeking for all the causes of some phenomenon. So we may note the effect of heat and of cold on water separately, the nature of steam, the effect of sudden change of density on moist air in the bell of an air-pump. A most interesting lesson may be given by gathering from our pupils, and discussing, all the instances we can of the disappearance of water—apparently into the air: clothes hung up to dry, wet pavements after a shower, water in a kettle boiled away, etc., etc. Again, the re-appearance of moisture from the air: the cold plate held over the steam from the spout of a kettle, the moisture on the outside of a glass of iced-water, dew when the sky is clear and the night fine, the washing-house, etc., etc. Then, the experiment with moist air in the bell of the air-pump,—the formation of the cloud due to the sudden lessening of pressure, the cloud depositing its moisture on the glass, and so on. We note the frequent, if not unvarying, concomitant in each

[1] See the admirable list of lessons under the heads of 'Form and space: Material and force: Life and organic products,' given by Dr. Wormell, in his paper on 'The teaching of elementary science,' in the *Educational times*, March, 1886.

[2] By *classification* and *definition*, I, of course, do not mean here the complete, full-grown acts of the adult, but the imperfect gradually-growing acts of the child. We are too often given to ignoring that there must be a growth and progress in these processes as in every thing else which a child *himself* does.

case, assume it as a cause, make further experiments on this assumption, in the way described in the 'method of experiment,' given above.

Causes may also be dealt with in our history lessons in numberless ways,— especially when the children are encouraged to bring their practical knowledge of modern things to bear on things of the past. The causes of the English settlement in Britain, of the invasions of the Norsemen and Danes, can be made fairly clear by the light of modern emigration and immigration. Why the English chose John for king, and their fellow-subjects on the continent (at least some of them) chose Arthur, will not be difficult for the children to discover; while, starting from our modern agricultural troubles, we may attempt a more elaborate chain of reasoning and accumulation of causes in explanation of the peasant revolt in the latter part of the fourteenth century. I do not think it will be needful for me to go into detail, — the demands of the peasants, the actual occurrences of the rebellion, and the events which immediately preceded and followed it, will suggest sufficient causes to the teacher and his pupils, and into these, investigation may then be made. Nor need I point out how strikingly suggestive of an explanation recent events have been, — distress of a general character, agricultural distress and disagreements, political discontent, the introduction of the element of rowdyism, socialism, wanton destruction of property by the regular London mob: even the guardians of order appear to have been as paralyzed and useless in this town of London on the one occasion as on the other. The analogy is strikingly complete. But we must be careful. Analogies are dangerous things, and are wont to carry us too far, and to make us read into a case evidence not really there. They should *suggest* the direction and nature of our inquiries, rather than be taken as in themselves sufficient explanations. But, after all, the great thing in work of this kind is to choose our subject-matter from common every-day events and things, or to bring what we choose at once into as close a relation as is possible with every-day experience and modern doings; moreover, we need not exhaust, or attempt to exhaust, all the causes for our phenomena. Provided that the children are made and *kept* keenly aware that there are other causes besides those we are considering, we shall do no harm in confining ourselves to the most prominent.

In the work we have been describing, we shall gradually have advanced from individuals to classes, — the statements at which we have been arriving will have contained predicates more and more general, and more and more abstract. Now we may begin to check and correct misstatements, to curb exaggerations, and to encourage the child to make more marked distinction between fancy and reality. We may begin some simple deduction, consisting of the application of some simple general principles, or general conclusions, to the explanation and solution of particular cases. Arithmetic and algebra — and, later, some of our language work — will be found of great assistance here. We could hardly begin with any thing better, perhaps, than the deduction of the rules for the multiplication and division of vulgar fractions from the general principles that regulate the nature of a vulgar fraction, and from the general principles of multiplication and division.

The ways of doing this are numerous, and familiar to every one: we, of course, generally begin by establishing the rules referring to those changes in the form of a fraction which do not affect its value, and in making clear the fact that the numerator and denominator of a fraction may be treated as the dividend and divisor of a sum in division; or, to put it concisely, such an expression as $\frac{2}{3}$ of 1 is the same as $\frac{1}{3}$ of 2. But whatever plan we adopt, of this we should take the greatest care, — that our reasoning is strictly and honestly deductive, and that its wording and its cogency are both thoroughly understood and appreciated by our pupils. This, however, is just the very thing that teachers, as a rule, will not take the trouble to do. They are in too great a hurry to get to the working of sums, — the mechanical manipulation of figures or symbols. This they seem to look upon as the great end of arithmetic work; and, when their pupils have applied a rule, never clearly understood, to some hundred perfectly mechanical examples, the teacher will lead them on with the utmost complacency to another mechanical exercise. Shall I be exaggerating if I say that more than half the teachers of arithmetic to children are unable to explain clearly to any one, when the time for explanation comes, the principles of, say short division? Not because the matter is abstruse and difficult, but because they have never thought it necessary to understand those principles.

The principles of the method of deduction, however, will come out more clearly in some of the problems of algebra, — such as the theory of indices, — and in simple propositions of theoretical geometry. It is lamentable how seldom one gets so easy a piece of reasoning as the theory of indices clearly and correctly set forth by pupils whom no diabolic complication of quantities and signs and brackets can dismay. They can manipulate almost any thing; they can reason out nothing.

The former is good enough in its way; but to omit the reasoning is, to my mind, to omit the most valuable part of the training. The text-books are, in a measure, to blame for this. We want the stages of the work more clearly marked, — the first assumption with regard to a^2, a^3, etc.; the more advanced assumption with regard to a^n, with the involved assumption that n is a positive integer; the first deductions as to the results of $a^n \times a^m$, and $a^n \div a^m$; the desirability of extending our notation, and introducing indices of *any* value; the necessity for a further assumption; our right to assume that $a^m \times a^n$ shall equal a^{mn+} for *all* values of m and n; the results of this assumption when applied to explain the meaning of a^n when n is zero, negative, and fractional. All these should be clearly marked, and clearly discussed; and, so treated, I know of no piece of elementary deduction more invigorating and satisfactory to the young learner. In geometry we usually fare better, — at least, in the text-books the reasoning is well linked and clearly set forth. The deductions are simple, and they have this great advantage, that they can be immediately put to use and be made to produce further deductions, while their value in practical work can be constantly exhibited. All this gives the child a sense of increased ability, progress, life, — which is so fascinating to him, and to all of us. It dispels the depressing feeling of futility which spoils so much of our work, and makes the school-room a tread-mill. But even in geometry the nature of the reasoning, and its limitations, are rarely sufficiently brought home to the learner. He is allowed to go on without an idea of how much, or how little, he has proved. How many, for instance, can explain why the induction of Euclid, i. 4, is a general truth, not limited to the case of the two particular triangles? Again, in language, analysis and parsing may afford excellent examples of the application of general principles to the explanation of particular cases, as may the correction of sentences in which the grammar or arrangement is faulty. But then we must be careful not to introduce distinctions which the language itself has never observed, or has long ago discarded. (The new Eton Latin grammar is a terrible sinner in this respect, with its aorist, and its array of tenses in the infinitive.) And we must abandon all such rubbish as that 'the second of two nouns is put in the genitive.' As to how the grammar of the mother-tongue, or of any other tongue, may be built up inductively, I need say nothing here. I have already more than once enlarged on the topic. Those who are still inquisitive as to my views and plans will find them fully set forth in my 'English grammar for beginners'[1] and my 'First lessons in French.'

Our next stage consists of the criticism of the statements of others, complex reasoning, and chains of demonstration. With regard to the two last, I have already somewhat anticipated myself, in what I have said about geometry and algebra. With regard to the first, I cannot do better than recommend exercises in the logical conversion of propositions and immediate inference. The rules are simple, and can be readily understood. They will be found, clearly set forth, in Mr. Jevons's little book, lesson x. From these we may pass to exercises in the detection of logical and material fallacies, which will be found both entertaining and highly useful. Mr. Jevons gives all the help that will be needed in lessons xx. and xxi., and likewise supplies us with many excellent examples — which may be supplemented from the well-chosen examples in Dr. Ray's hand-book of 'Deductive logic' (published by Messrs. Macmillan & Co.). Those which touch upon the personal experience of the learner will be the best. With regard to algebra and geometry, I will merely add that I think the first lessons in each should be much more carefully treated than is usually the case. In beginning algebra, we pass from the particular instances and particular symbols of arithmetic to general cases of number and general symbols; and we should be at the pains of making quite clear the nature of the change, the enlargement of limits, and the practical value of the new treatment. All this is far too much hurried over, as a rule; and an excellent opportunity for exercising the reasoning powers, and for what is even more important, exciting the curiosity of the pupils and displaying the practical utility of the work about to be attempted, is lost. As professor De Morgan pointed out, there is much to be learned from contrasting the proofs of $\frac{a+b}{2} + \frac{a-b}{2} = a$, or of $(a + b)(a - b) = a^2 - b^2$, with similar propositions in arithmetic; while the early introduction of problems involving simple equations is far more valuable and stimulating to the beginner than all the clearing of brackets, and simplifying of fractions and the rest, with which he is usually indulged. The corresponding work in geometry is the passing from the particular cases and inductions of practical, to the deductions and general truths of theoretical work. We should dwell upon the limitations of our earlier work; the reasons why a practical proof, such as that in

[1] In especial, I would refer to the carefully graded lessons by means of which I arrive at the definitions of the parts of speech, and to the lessons which show how, by *induction*, we may, and should, arrive at the rules relating to the order of words in a sentence, and to the use of stops.

Euclid, i. 4, holds generally, while we need something more than practical experiment to prove, say, that vertically opposite angles are equal, or that the three angles of any triangle are always together equal to two right angles. The need for proofs that are generally true may be brought out very clearly in such a matter as the consideration of the best practical methods for measuring plane surfaces, or some other similar work. In any case, let us bring home to the learner the need for more general proofs, and the nature of the method adopted for obtaining them; while, all through our geometrical work, let us keep in mind how refreshing it is to be allowed to see and appreciate the bearing of theory on practice, — the practical utility of the results of our theoretical work. Once again, what better means can we have for exercising pupils in mixed inductive and deductive reasoning than political economy? We may begin with a story from Miss Martineau's collection, — or, to be more precise, we may take 'The shipwrecked sailors,' from Mrs. Fawcett's 'Tales in political economy,' and work up to the question as to whether luxurious expenditure and waste are good for trade, or to the great problem of demand and supply, and the price of commodities, — making deductions from the principles at which we arrive, and testing them by comparison with the results of practical experience.

I will conclude by reminding you, that, for pure induction, you will generally have to rely on the physical sciences, — of which botany, energetics (if I may use the word), and chemistry will be the best for school purposes; while, for deduction, the whole field of mathematics lies before you. I may add that you will find an excellent model lesson in induction on the 'pile-driving machine' in Professor Payne's 'Lectures on education.' In mathematics, perhaps the best and simplest example of induction suitable to beginners is the well-known 'binomial theorem' for positive integral indices. H. COURTHOPE BOWEN.

MODERN BIOLOGY AS A BRANCH OF EDUCATION.

A GLANCE at our higher educational institutions to-day shows a tendency toward an increase in the importance of biological science. Everywhere biology is being separated as a distinct department, and at least one school is founded for the express purpose of pursuing this study. An increasing stress is being placed upon this science as a part of a liberal education, and its number of students is growing rapidly. We wish, in a few words, to show why this is so, and to give the grounds upon which biology is every year demanding more recognition.

Biology is sometimes called a *new* science. This is not because the subject-matter treated of is new, nor because living nature is a new subject for study, but rather because the method of study has so changed in the last twenty-five years that the study of life appears under an entirely new aspect. As material for a descriptive science, animals and plants have been studied for centuries, but biology as a dynamical science is of comparatively recent growth. Modern biology is neither zoölogy nor botany, though it of course includes the study of both animals and plants. The terms 'zoölogy' and 'botany' usually convey to the mind the idea of long names and tedious descriptions, with an overwhelming abundance of uninteresting details, and the student well asks what is their value to him. If biology offered to its students to-day no more than a description of animals and plants, it would be well questioned whether it should in justice demand any greater attention than has been allotted to zoölogy and botany for fifty years past. But scientific teachers are beginning to see that the learning of names and descriptions should bear about the same relation to biology that the learning of dates bears to history. Some dates must be learned in studying history, and some names and descriptions must be learned in studying biology; but the former does not constitute history, nor the latter biology. The rapid extension of observation on vital phenomena, and the more careful thought thereon, have been teaching scientists to comprise large groups of facts under general forms, and thus to deduce general laws regulating life. It is the study of these principles which is coming more and more to constitute the science of biology. The enormous multiplication of species is making zoölogy and botany unwieldy subjects to be treated in any general way. Classifications have, by reason of recent discoveries, grown so intricate and complicated that they can no longer be taught to the general student with any degree of satisfaction. But this very increase in discovery is adding to science new laws, is rendering intelligible the older ones, so that the material for the study of biology, as separate from zoölogy and botany, is becoming more abundant. Biology is thus rapidly freeing itself from the dry bones of detailed classification, and becoming of more and more interest and significance to the general student. Biology is growing to be more the study of life-principles as illustrated by animals and plants; is becoming, therefore, more a study of life, and not so much as it has been a study of living things.

It is biology with some such scope as indicated above, that is now claiming to be recognized as a necessary part of a liberal education. Education

has three primary objects : 1°, it should give mental training ; 2°, it should give a certain amount of practical knowledge ; 3°, it should place the student in such contact with philosophical thought that he may be able to understand the trend of thought at the present time. The new science of dynamical biology claims attention as assisting in the accomplishment of all three of these objects.

The value of biology as a means of mental discipline is chiefly in exercising the powers of observation. No course in this study is in any way complete without an accompanying course in laboratory work, though the amount of such work may be sometimes very small. There is nothing better adapted to teach the student to use his eyes accurately than a course in laboratory work upon living things, including microscopic study, dissection, and analysis. The value of this sort of education is, indeed, too plain to require more than a notice.

There is undoubtedly a growing demand in this country that studies should have a practical value ; and for any new study to force its way into wide acceptance, it must be able to show that it has some direct utility. Now, biology is by no means a 'bread-and-butter' study, unless, perchance, it be to those who aim to teach it. But it does give the student knowledge in those directions which Spencer calls the essentials of education, and which are too often neglected. It teaches him to be a good animal. Aside from its value as a preliminary medical training, biology gives an education which every one needs. There is hardly a discovery of the century which bids fair to produce more influence upon the human race than the germ theory of disease. This discovery is rapidly modifying methods of dealing with contagious diseases ; and it is an injustice to the student to send him into the world without a knowledge of these general facts, the significance of sanitary precautions, and the methods of avoiding disease. But aside from such facts, it is hardly possible to overestimate the value to every one of a study of the laws of life. The student learns that he, too, is an animal, and under the influence of the same laws which he finds elsewhere, and comes slowly to realize the meaning of many of these laws with a vividness which can be produced in no other way. He learns of the effect of surroundings upon the growth of living things, and that animals are largely what circumstances make them. He gains a strong impression of the lasting effects of habits, sees that nothing is too small to be without its influence. He is brought face to face with the degrading effects of parasitism in all its forms ; sees that inactivity is universally followed by degradation, and that only active animals can rise in nature ; learns that luxury is always the precursor of degradation, while adversity, if it be not so great as to destroy, is sure to exalt the animals under its influence. All of these factors, together with the physiological laws which he must obey, and hundreds of others of smaller import, are or should be forced upon a student who has taken a good course in biology ; and these facts, though not teaching men to earn a living, do teach them to make better use of their lives.

But, after all, the chief reason why biology is obtaining a greater recognition as a necessary branch of education, is none of these. but rather because of its relations to philosophical thought. Modern biology represents to us a final step of the belief in the universality of law. A comprehension of its import is therefore necessary to one who wishes to keep abreast of modern thought. From the time when the curiosity of early man was aroused concerning nature around him, he has been constantly asking for causes. At first the only sort of causality of which he had any conception was that of personality, and he therefore conceived that behind every phenomenon of nature there was a personality. The explanation of causes was thus polytheism. Slowly and irregularly there arose from this belief the nobler conception of monotheism. But all through the past centuries the God of monotheism was regarded as forming no part of nature proper, but as holding aloof from it, and interfering now and then to perform miracles. Indeed, even to-day we find not a few who still retain this conception, and scarcely see any room for God except to explain mysteries. But these mysteries have been disappearing. Little by little did more extended observations show that nature acts with uniformity, and there thus arose, vaguely at first but more clearly afterwards, the idea of natural law. Since the time of Newton's discovery of the first grand law of nature, there has been inaugurated a new method of research. Science, as we now understand the term, has arisen, and has been trying to reduce the varied phenomena of nature to an order, to discover the laws regulating them, and to investigate the former mysteries of nature, and explain them by the simple application of discovered law. One after another have the various realms of nature been studied, and one after another have they been comprehended under the universal reign of law. Nature's mysteries have been constantly uncovered and rendered intelligible. The thunder is no longer a bolt thrown by an angry deity, nor is the north wind the breath of an avenging god ; but each falls in with the general order of nature, and is explained by the

action of known laws and forces. Until within very recent times, however, it has not been imagined that the phenomena of life could be brought under the same laws which regulate the inorganic world. Life seems so different from all that is not living that it has been regarded as standing by itself. It is, withal, so mysterious that it has at all times been regarded as a direct instance of almighty power, and living things have been looked upon as miracles concerning which it was almost sacrilege to question.

Modern dynamical biology owes its existence to the attempt to apply to the organic world the same course of investigation which has been successful elsewhere; nay, indeed, to apply to life the same chemical and physical laws which govern the inorganic world. The first great step was taken in this direction by Darwin when he tried to show that species were not to be considered as special creations, but as having had a natural origin. Zoölogy and botany, as they had been studied before, were simply statical sciences, merely studying and classifying facts as they were found. Modern biology is a dynamical science, in that it attempts to explain the facts of life. All vital phenomena have been attacked with this purpose in view, and biologists are now strenuously trying to come to some explanation of the fundamental fact of life itself by the application of chemical and physical laws.

It is plain enough that such study and such conclusions are of great significance to the thoughts and beliefs of every one. It is not strange that these conclusions, removing as they do so many miracles from nature, should be regarded by many as conflicting with all theistic belief, for we are all inclined to think a fact is understood when it is comprised under any law. But it is equally evident that more careful thought shows that, even accepting these conclusions of biology, we are by no means able to say we have fathomed life, for we do not understand the reason for the existence of any single chemical or physical law. But whatever be the conclusion which may be reached as to the ability of biologists to explain life-principles, or as to the significance of the explanation when reached, it is certainly a necessity for any one who wishes to comprehend the thought of the times to get acquainted more or less intimately with these attempts of the *new* science. The students who go out from our higher schools are to take a stand among the foremost thinkers. Indeed, they are, it is hoped, to advance the thought of the world. Whether they be theologians, philosophers, scientists, or teachers, it is necessary for them to realize the meaning of the application of dynamics to life: they should understand the positions held by advanced biologists, and know at least the sort of arguments used to support these positions. In this fact, then, lies the essential reason for the growing importance of this study. As a branch for special study, biology has its own fascination and defence. But as fast as it becomes freed from the burden of detail, and becomes a study of life-principles, just so fast will it become recognized as a necessary part of the education of the general student

H. W. CONN.

THE FRENCH LYCÉE.

WHILE much of the educational inspiration of the day is drawn from Germany, it must be borne in mind that France is actively engaged in thinking out the great problems which are of common interest to all nations. We hear much of the 'gymnasium' and 'realschule,' but not so much of the 'lycée.' This word should call to our minds as definite and accurate an idea as the word 'gymnasium' does. The material for such an idea is contained in a short account of the curriculum of a French lycée recently published by Mr. W. H. Fraser of Upper Canada college.

The word 'lycée' itself, in its present application to the secondary colleges of France, dates back to Napoleon Bonaparte, and was given by him to them when he re-organized the university system. The name was afterwards changed to 'collége royal' at the restoration and under Louis Phillippe, but was changed again to lycée in 1848. 'Lycée' is the French form of λύκειον, the gymnasium near Athens, where Aristotle assembled the members of his school of philosophy. By extension it was applied to certain schools in Paris devoted to science and literature. Almost every considerable city and town in France has now its lycée, whilst in Paris there are several of them, for example, Lycée Henri IV., Louis-le-Grand, St. Louis, and others, — enormous establishments affording accommodation to many hundreds of students, both *internes* and *externes*, as the students in residence and the outsiders are respectively called. Until recently, only boys enjoyed the privileges of these colleges, but now provision has been made in several places, including Paris, for the education of girls also. Their colleges are entirely distinct, and the programme of those for girls is, in the main, a modified form of that prepared for their brothers.

The whole course of the lycée should be completed, and generally is completed, by the pupil before he has reached his twenty-first year. It may be finished, however, by the eighteenth year. This is not astonishing, when we reflect that

the pupil enters at an early age, that the sessions are long, and that he moves forward without break or interruption through a programme carefully weighed, measured, and detailed beforehand. The class hours are now twenty a week, as compared with twenty-four previous to 1884, a reduction owing to the fact that evidence of overwork had become apparent.

The whole work is divided into eight classes, numbering from eighth, as the lowest, up to second, which is followed by the classe de rhétorique and the classe de philosophie, not numbered. There is below the eighth a preparatory class, which is, in its turn, preceded by an elementary division of three classes. Thus the boy may enter very young, and may be promoted to the eighth class when he is nine years old. The work in the preparatory class consists of French together with German or English; to these alone four hours out of the twenty are devoted: also history, geography, and two hours a week for arithmetic, together with an hour each of object lesson and drawing. At nine years of age, then, the collegian is fairly launched upon his career. The number of hours devoted to his mother-tongue is still the same, nine; he has still four hours a week in English or German; history takes an hour and a half, and geography the same; arithmetic and object lessons take three hours, while drawing, as in the preparatory class, occupies an hour. The next year, if he has not failed at examinations, the pupil proceeds to the seventh class, and must be at least ten years old. In it, the division of time to the various subjects is precisely the same.

When the pupil is at least eleven years old, and in the sixth class, i.e., at least six years from the completion of his course, a marked change takes place in the subjects of study, and in the disposition of time. His native language drops at once to three hours a week; he has been exercised in it for years nearly half of the whole class-time, and his style has been largely formed. Perhaps this early and thorough practical exercise in his mother-tongue is a reason why almost every educated Frenchman can express himself in language always elegant, smooth, and concise. What is lost by French and modern languages in the programme is gained by Latin, which rises at once to ten hours a week. History also gains an hour, arithmetic and science losing an hour, while drawing gains the time which they lose. Thus, when the Latin grammar and 'De viris illustribus Romae' is begun, the boy is reading in English Miss Edgeworth's 'Tales,' 'Evenings at home,' and Miss Corner's 'History of England,' or Benedix's 'Der Process,' 'Griechische Heroengeschichte,' etc., in German, with exercises in reading and conversation. In arithmetic, he is doing vulgar and decimal fractions, while in drawing, he is attempting architectural design and the human figure.

In the fifth class the hours are precisely the same until January, when Greek is begun, and to it two hours a week are devoted. The Latin has now got as far as the 'Fables of Phaedrus,' 'Cornelius Nepos,' and the 'Metamorphoses of Ovid.' The Greek is elementary, but in English, Sir Walter Scott's 'Tales of a grandfather,' and other works of similar difficulty, stand side by side with Grimm's 'Fairy tales,' Andersen's 'Tales,' and 'Der Eigensinn' of Benedix. The history corresponds to the language studied, so that in this class Greek history is almost exclusively read. Arithmetic has got as far as the rule of three, and geometry is continued. An elementary course of botany balances a similar course of zoölogy in the preceding year.

In the fourth class, only two hours are devoted to the mother-tongue; Latin has six and Greek six hours; modern languages, history, science (including mathematics), drawing, two each, and geography one. French classical authors are read, Caesar, Ovid, and Virgil, in Latin, conjoined with Latin composition. In Greek, Xenophon, Lucian, and composition are done. Lessing, Musaeus, Kotzebue, and Hoffman, with De Foe, Irving, etc., are read in German and English. Roman history is continued, while a course of geology replaces the botany of the preceding year.

At not less than fourteen years the third class is entered, and the work becomes heavy. In this class, mathematical work increases, and has three hours assigned to it. Latin and Greek have each five hours, with modern languages about as before. It would be tedious to go into detail in all the classes; the principal difference to be noted in the development of the scheme in the next three years is the increasing attention given to mathematics, physics, and history.

At fifteen years, if the boy be clever, he is in the second class. After the completion of this year's work, the programme divides into classe de rhétorique and classe de philosophie. The French classics are continued in the second class, and the older French literature and philology are studied, together with the history of literature. Virgil, Horace, Cicero, Livy, and Tacitus are read in Latin; and Homer, Euripides, Plato, Xenophon, and Plutarch in Greek. In the living languages, pieces from Goethe, Schiller, Hauff, Shakspeare, Goldsmith, Walter Scott, and Dickens are read, and the mathematics go about as far as the end of quadratics.

As stated above, the course now divides into

two classes. In the classe de rhétorique, the languages prevail, while in the classe de philosophie, metaphysics, mathematics, and the natural sciences prevail. A good idea of the proportion may be obtained from the time devoted to each subject. In the classe de rhétorique, French, Latin, and Greek have each four hours; modern languages, history, two hours each; mathematics, etc., three hours, and geography one. In the classe de philosophie, mental and moral science and logic, and the French authors, occupy eight hours, Latin and Greek one, modern languages one, and history two; science (including arithmetic, algebra, geometry, physics, chemistry, and physiology) has eight hours. A fair idea of the difficulty of this final year's work may be obtained by a glance at the authors in the classe de rhétorique. Nearly all the principal French classical authors are read; in Latin, Terence, Lucretius, Virgil, Horace, Cicero, Livy, Tacitus; in English and German, Shakspeare, Irving, Byron, Tennyson, Dickens, George Eliot, Lessing, Goethe, and Schiller; a good deal of modern history is added, with plane and spherical geometry and some chemistry. It might be stated that two hours a week are devoted to drawing, but that in the higher classes it is considered an extra.

If we reduce the above sketch to percentages, taking into account the whole time of the student, from entrance into the eighth class till the end of his course, we obtain the following: —

Subject, French, 20.62 per cent; Latin and Greek, 33.74; modern languages, 12.23; history and geography, 14.68; mathematics and science, 14.68; mental and moral science, 5.00; drawing, 1.25.

In this course some things are obvious. The preponderance given to language and literature, Latin and Greek, is especially noticeable. It cannot be said that the programme is a light one. Another point is, the very small part which options play in it; certain options are allowed to those who intend to become teachers of the natural sciences or mathematics, otherwise the framers of it seem to take for granted that every boy should go through the same course of mental gymnastics. For those who wish to study a profession, or for such as wish to specialize further, the university is open, and the university course presupposes as a basis the broad, general culture of the lycée.

During the winter of 1885–86 there were 14,633 students in the Italian universities: 3,894 of these were at Naples, 2,073 at Turin, 1,216 at Rome, 1,163 at Bologna, 1,008 at Padua, and 1,005 at Pavia. At Ferrara there were but 39. Of the whole number, 5,195 were students of medicine.

WHEN SHOULD THE STUDY OF GREEK BE BEGUN?

The biennial conference of the head masters of the great English schools and colleges always develops some interesting discussions on educational topics of current interest, as well as some very uninteresting ones on matters of purely local interest and importance. At the meeting in December last, Dr. Fearon of Winchester moved two resolutions regarding the study of Greek, and spoke at length in support of them. The resolutions read, 1°, that it is desirable that the teaching of Greek to boys should be begun at a later age than it is at present; 2°, that it is desirable that a knowledge of Greek should not be required for admission to the classical side of the public schools.

In the published report of Dr. Fearon's remarks, we read that he began by explaining what he meant by the words, 'at a later age than at present.' He said that he had recently himself collected statistics, and found, that, of 385 boys now learning Greek, 213 had begun at ten or earlier, and of these 213, seventy-four had begun at nine or earlier. The average age was ten, or rather younger. He had also consulted a number of preparatory school-masters, and, almost without an exception, they put the time that it took them to prepare boys in Greek for admission into public schools at from two to three years. The first proposition he wished to establish, was, that the cause of Greek would not suffer by raising the age of beginning from ten to thirteen. For the last year and a half he had kept accurate records of all boys who had passed through Winchester, and he had submitted their records to his staff. It was difficult to arrange particular facts in a way that would carry general conviction, but the inference that he and his assistant masters — almost without an exception — had drawn, was, that boys who had started Greek at ten were no better than those who had started at eleven. Some of the most able and brilliant classical scholars at Oxford and Cambridge had begun Greek after they were fifteen. But he did not rest his case on his experience with promising boys, who, it might be argued, would come out well under any system. The facts as to backward boys could not be got over, and were most humiliating. Of thirty-five boys who had lately entered in the bottom division at Winchester, only three had reached a point in the school where they read anything harder than the shorter form of an elementary Greek reader. One of them had studied Greek for three years before entering, and for seven years at Winchester; two others had reached that point after three and a half

years; and thirty had not reached it at all. Such a state of things appeared to him intolerable, and he had fully made up his mind to deal with it.

The experience of the continent was wholly opposed to the English plan. At Basel, no language except the mother-tongue was learned till ten, then Latin was begun, and French and German not till thirteen. The evidence from Germany was more pertinent, for there both systems had been tried. In the gymnasia of Hanover, before the year 1866, Greek had been begun in *tertia* (average age thirteen), whereas in Prussia it was begun in *quarta* (average age twelve). After 1866, the Hanoverian system was brought into uniformity with the Prussian, and this was continued till six years ago, when it was determined not to begin Greek till fourteen. The testimony of the professors of Hanover is, that, at eighteen, boys know just as much Greek by beginning at fourteen as by beginning at twelve.

Passing to his second proposition, Dr. Fearon maintained that other subjects were squeezed out by the premature study of Greek. In the last five years they had had boys from 135 preparatory schools. He had sent a circular to sixty-two of the more important among them, and received answers from forty-five. One of the questions he had asked, was, "Do the requirements of public schools compel you to disregard subjects to which you consider more importance ought to be paid?" To this question, twenty-one had answered 'no,' and twenty-three 'yes,' but he confessed that the question was a wicked one, and that he could hardly expect masters to pass condemnation on their own system of teaching. In this matter they must go behind the judgment of preparatory masters, and he found by experience that it was precisely in this matter that preparatory masters erred and came short. They sent to Winchester, boys admirably grounded in Latin grammar, but sadly deficient in English history and French. In the last year he had been advised to reject boys for total ignorance of French. And he found, moreover, not only that the most backward boys in Latin and Greek were the most backward in French, but also that they were comparatively more backward in French than in classics, proving that all their energy had been put into Greek and Latin. The only safe guide in this question was to look to the training of boys' minds and education generally. To judge from the experience of the teachers of lower forms, and his own experience as an examiner, the boys who were best at a mechanical knowledge of Greek grammar were those who were getting least good as to the culture of general intelligence. He was convinced, from his own observation, that the two main difficulties of young boys arose from the multiplicity of subjects, and from the number of subjects all of the same kind. Their brains got perfectly muddled by being driven from one point to another. So far from the study of Greek suffering by the change, he believed that it would gain. Boys would come more freshly to the subject at thirteen or fourteen, with minds more matured, and able to see the points that masters were driving at, and we should rid of one absurdity our present Procrustean education.

In conclusion, he recommended: 1°, That the study of Greek should not begin before the age of thirteen or fourteen, and that it should not be introduced at all in the entrance examinations of public schools. This step he intended to carry out himself. 2°, That Greek should be rigidly excluded from examinations for entrance scholarships. Latin and English would afford a much sounder test, and it would be a great advantage to have from the first the teaching of Greek in their own hand. 3°, He would give up Greek with boys who showed no taste for Greek, or who intended to leave school at seventeen. He knew that this declaration would lose him votes, but he could not himself continue the system which allowed boys to be studying Greek delectus for ten years. They could not dictate to preparatory schools, but these would follow if the head masters gave them a lead. By thus postponing and limiting the study of Greek, they would do nothing to injure the cause of Greek scholarship, and they would do much to set the education of the country on a more satisfactory basis than it was at present.

Familiar as this sort of argument is in the United States and on the continent of Europe, it is still considered ultra-radical in England; and it is somewhat surprising that Dr. Fearon's resolutions and remarks met with no greater opposition than they did. In fact, a number of head masters sided more or less strongly with Dr. Fearon. No immediate action was taken on the resolutions by the conference, however, and they were referred to a committee, after having an amendment to the effect, that, "it is desirable to arrive at some greater agreement as to the stage in education which should be reached before Greek is begun by boys intended for a classical school," tacked on to them.

THE GREEK ELEMENT IN ENGLISH.

THE crusade against the study of Greek, which is the fashion just now, is not always successfully met by the defenders of that study, because they either understate their own position or else miss altogether the true point of the discussion. The

study of Greek is not going to retain its place because some celebrated mediaeval and modern intellects were trained in it. It must rest its claim upon the higher ground of its humanizing influence and its unexcelled literary culture. Greek also appeals to us as having no inconsiderable share in the formation of our own language as we know and use it to-day, especially in the nomenclature and terminology of philosophy and the sciences. The value of the study on this ground is not referred to often enough, and we have never seen it more simply and deftly emphasized than in Dr. Goodell's little book entitled 'The Greek in English.'[1] As the author puts it in his preface, "The object of this book is to enable pupils to gain some real and living knowledge of that part of English which came from Greek. . . . It merely attempts to teach that minimum which even those who wish to banish the study of Greek from our schools would admit can least easily be spared; and it is written in the belief that that portion is absolutely essential to a ready command of a full English vocabulary." And this is the kernel of the book. It is written to help students to an understanding of English, in so far as English is derived mediately or immediately from Greek.

The work is arranged about a grammatical outline somewhat like that usually found in Greek primers of the old-fashioned sort, because the author believes that to be the simplest and quickest way of learning what he has to teach. The vocabulary is rather representative than complete, but it is reasonably full. We are quite ready to believe that Dr. Goodell's book will commend itself to many preparatory teachers as giving, not all that the beginner who has a college course in view wants to know, but that minimum of Greek that is a necessary part of the equipment of every well-educated man.

Dr. Goodell makes a curious slip — unless, indeed, he holds the not impossible but improbable opinion advanced by Clement of Alexandria, that 'metaphysics' is equivalent to supranatural — when he instances 'metaphysics' as one of the words into which a deeper insight is given us by a knowledge of Greek; for the prevailing opinion is that the word 'metaphysics' is a conglomerate used by Andronicus of Rhodes to denote that portion of Aristotle's writings which came after the treatise on physics in his arrangement (*τὰ μετὰ τὰ φυσικά*). Therefore the fact that metaphysics means ontology, the science of being, is purely accidental; it might just as well have come to mean ethics or psychology; and a knowledge of Greek, while it explains the genesis of the word, can hardly be said to give us a 'lively sense of its exact meaning.'

[1] *The Greek in English.* By THOMAS D. GOODELL, Ph.D. New York, Holt. 16°.

ROSENKRANZ'S PHILOSOPHY OF EDUCATION.

THE influence of Professor Rosenkranz on the educational thought of Germany has been very great. Born early in the century, he was a university student at a period of great philosophical and pedagogical activity. Fichte, Schelling, Hegel, and Schleiermacher were then the great leaders of German thought, and Rosenkranz came under the personal influence of the two latter. While yet a very young man, — he was twenty-eight years of age at the time, — he entered upon his long tenure of the chair of philosophy at Königsberg in succession to Kant and Herbart. The work of which the book before us is a translation was published in 1848, under the title 'Paedagogik als system.' It may be said to have raised pedagogical discussion in Germany from the petty details of kindergarten and administration to the high plane of philosophy. The work has also had a wide circulation, considering its character, in this country, for it was originally translated, some fifteen years ago, for the *Journal of speculative philosophy*, and, in adition to its circulation in that form, two thousand copies of a reprint failed to meet the demand for it. For the present and second edition, which Dr. William T. Harris publishes as the first volume in the International education series, edited by him, the translation has been revised and popularized, and accompanied with a full commentary and analysis, prepared by Dr. Harris himself. These latter are so elaborate that they unquestionably veil to a certain extent Rosenkranz's own work, but just as unquestionably do they add to the value of the book for teachers.

The translation of the title by 'philosophy of education' is a happy one, for it sets the book before American readers in its true light. It tells them in a word that there is a science of education, and that that science claims a place in the philosophical encyclopaedia in the closest connection with psychology and ethics. For pedogogics may be best described as psychology and ethics applied. The title indicates, also, the stand-point and method of the book, for, as Dr. Harris says in his preface, to earn this title, "a work must not only be systematic, but it must bring all its details to the test of the highest principle of philosophy."

It must be premised that Rosenkranz's philosophy, and hence this theory of education, is

The philosophy of education. By JOHANN KARL FRIEDRICH ROSENKRANZ. Translated by ANNA C. BRACKETT. New York, Appleton. 12°.

strongly Hegelian in form and statement, and hence abounds in the eccentricities and metaphysical peculiarities of that great thinker. But to our mind, this does not impair the usefulness and timeliness of the book, for whatever Hegel's exaggerations may have been, and despite the fact that his philosophy is on the wane, he seized hold on a great number of spiritual truths, and formulated them as they had never been formulated before.

The key-note of Rosenkranz's pedagogical philosophy is, that, "man's true nature is not found in him at birth, but has to be developed by his activity; his true nature is his ideal, which he may actualize by education."

The book is divided into three parts. The first considers the idea of education in general, its nature, form, and limits. The second part treats of the special elements of education, the physical, the intellectual, and the practical (in the sense of will-education), and discusses the various stages of the process of education and the problems presented by them. The third is given over to particular systems of education, and is a short history of educational theories.

Rosenkranz strikes a true note when he puts pedagogics on a psychological basis, "the nature of education is determined by the nature of mind" (p. 19), "the general form of education is determined by the nature of the mind" (p. 26), and *passim*. The limits of education are three. The first is the subjective limit, and is found in the individuality of the pupil. "Whatever does not exist in this individuality as a possibility cannot be developed from it. Education can only lead and assist: it can not create" (p. 47). The second limit is the objective one, and lies in the means which can be appropriated for education. "That a talent for a certain culture shall be present, is certainly the first thing; but the cultivation of this talent is the second, and no less necessary. But how much cultivation can be given to it, extensively and intensively, depends upon the means used, and these again are conditioned by the material resources of the family to which one belongs. The greater and more valuable the means of culture which are found in a family, the greater is the immediate advantage which the culture of each one has at the start" (p. 48). The third limit of education, Rosenkranz calls the absolute limit. And this is defined as, "the time when the youth has apprehended the problems which he has to solve, has learned to know the means at his disposal, and has acquired a certain facility in using them. . . . To treat the youth, after he has passed this point of time, still as a youth, contradicts the very idea of education, which idea finds its fulfilment in the attainment of this state of maturity by the pupil" (p. 49). After this limit is reached, self-education supplants instruction by teachers, and the ideal to be had in view, and the methods to be followed, must have been implanted during the antecedent period.

It would unduly tax our space, and it is not necessary, to select for emphasis the many valuable and suggestive points in Rosenkranz's treatment of specific educational subjects. They will appeal at once to every educator who reads the book. But some specially pregnant passages may be quoted. "*Mens sana in corpore sano* is correct as a pedagogical maxim, but faults in the judgment of individual cases; because it is possible, on the one hand, to have a healthy mind in an unhealthy body, and, on the other hand, an unhealthy mind in a healthy body. Nevertheless, to strive after the harmony of soul and body, is the material condition of all normal activity. The development of intelligence presupposes physical health" (p. 68). "What we learn through books forms a contrast to what we learn through living. Life *forces* upon us its wisdom; the book, on the contrary, is entirely passive. . . . If we are indebted to life for our perceptions, we must chiefly thank books for our understanding of our perceptions. We call book-instruction 'dead' when it lacks, for the exposition which it gives, a foundation in illustration addressed to sense-perception, or when we do not add to the printed description the perceptions which it implies; and these two are quite different" (p. 121). "The course of study must be arranged so as to avoid two extremes: on the one hand, it has to keep in view the special aim of the school, and, according to this, it tends to contract itself. But, on the other hand, it must consider the relative dependence of one specialty upon other specialties and upon general culture. It must leave the transition free, and in this it tends to expand itself" (p. 133). "Social culture contains the formal phase, moral culture the real phase, of the practical mind. Conscience forms the transition to religious culture. In its universal and necessary nature, it reveals the absolute authority of spirit. The individual discerns, in the depths of his own consciousness, commands possessing universality and necessity to which he has to subject himself. They appear to him as the voice of God. Religion makes its appearance as soon as the individual distinguishes the Absolute from himself, as a personal subject existing for and by Himself, and therefore for him. The atheist remains at the stage of insight into the absoluteness of the logical and physical, aesthetic and practical, categories. He may, therefore, be perfectly moral. But he lacks religion,

though he loves to characterize his uprightness by this name, and to transfer the dogmatic definitions of positive religion into the ethical sphere" (p. 158). "Education has to prepare man for religion in the following respects: 1°, it gives him the conception of it; 2°, it endeavors to have this conception realized in his life; 3°, it subordinates the theoretical and practical process in adapting him to a special stand-point of religious culture" (p. 159).

In treating the history of educational theories, Rosenkranz distinguishes three types, the national, the theocratic, and the humanitarian. "The first works after the manner of nature, since it educates the individual as a type of his race" (p. 188). The theocratic system resembles the national, but it makes the ground of the uniformity of the individuals not merely the natural element in common, but it takes as the common interest the result of spiritual unity, which neglects nature and concentrates itself upon the events of its own history. "The theocratic system educates the individual as the servant of God" (p. 188). The third system "emancipates the individual, and elevates him to the enjoyment of freedom as his essence; educates him within national limits which no longer separate but unite; and, in the consciousness that each, without any kind of mediation, has a direct relation to God, makes of him a man who knows himself to be a member of the spiritual world of humanity" (p. 188).

It is almost impossible to exaggerate the importance of this treatment of education for teachers and the American public generally. Too often given over to shallow theory, false practice, and superficial sentimentalism, a broad, deep, and philosophic treatment of education will be for them both a stimulant and a tonic. To those used to the trashy educational journals and books now so current among us, Rosenkranz will undoubtedly be difficult reading. But he needs more than reading; he must be studied. The certain effect of the study will be to develop the intellectual and moral insight of the student, and, where a vicious activity and bold experimentalism exist, to substitute for them a true practice and a sound philosophy.

THE Swedish society of anthropology and geography has published a collection of drawings made by C. Bovallius during his stay in Nicaragua in 1882–83. Though zoölogical researches were the main object of the author's journeys, he availed himself of the opportunity to make some archeological collections. He went over the same ground as Squier did more than thirty years ago, but he found many new relics of the ancient inhabitants. He publishes drawings of many statues hitherto unknown, and as he does not consider some of Squier's reproductions sufficiently exact, he gives his own copies of the originals. The volume contains 41 plates, and a map of Nicaragua and Costa Rica. In the plates we find represented objects from Zapatera, a small island in the lake of Nicaragua, rock carvings from Ceiba, a small island near the former, and ceramic objects from Ometepic, Zapatera, and Ceiba. The author gives a brief introduction on the tribes of Nicaragua, and descriptive text to accompany the plates.

— The last number of the *Quarterly journal of microscopical science* (vol. xxvii. part ii. p. 285) contains a very severe criticism of Dr. Patten's paper on the 'Eyes of mollusks and arthropods.' The review is unsigned, but was presumably, we venture to say, written by the editor of the journal, Professor Lankester, who is certainly a competent authority to pass judgment. Fault is not found with the new observations recorded by Dr. Patten: on the contrary, they are accepted as sincere and valuable. The full severity of the condemnation is turned upon the theories and generalizations of the author, and upon his criticisms of preceding investigators. The accusation is brought that the author has promulgated many false views and crude theories, such as would have appeared possible only to an ignorant thinker; further, that he has recklessly set aside by simple denials many statements of esteemed observers, on the ground that they were irreconcilable with his own conclusions; finally, that he used a tone in his criticisms which is unpardonable in a scientific discussion under any circumstances. It is very rare that such heavy charges are made against any scientific writer. Their extreme gravity renders it specially incumbent upon us to reserve our judgment until Dr. Patten shall have made his answer. As we have directed attention to the accusation, we shall be glad to give due attention also to the defence.

— As part of the scheme of the late Colonel Roudaire and M. de Lesseps to form an inland 'African sea,' it was suggested that an attempt be made to obtain water from artesian wells, with the idea of cultivating the sourrounding country and using the rents for building the canal intended to connect the Mediterranean with the proposed sea. The first well was started in May, 1885. Water was found at a depth of 295 feet, and in June, 1886, was running at the rate of 2,340 gallons per minute. As a consequence, the banks of the Melah River (Tunis), which a very few months ago were deserts, are now populated and productive.

Contents of foreign educational periodicals.

Central-organ für die Interessen des Realschulwesens, December issues. — Zweikämpfe zwischen Sprichwörtern, Dr. Friedrich — Womit muss der englische Unterricht in Deutschland beginnen? Dr. Ernst Friedrich. — Die Einheitsschule. — Nachrichten, Bücher. — Anzeigen, u.s.w.

Zeitschrift für das Realschulwesen. — Die Bezeichnung der Aussprache in den englischen Lehrbüchern, Prof J. Resch. — Ueber das sphärische Dreieck, Eduard Grohmann. — Schulnachrichten, Recensionen, u.s.w.

Revue internationale de l'enseignement, Jan. 15 — La question des universités françaises, Ernest Lavisse. — La réforme des études juridiques en Allemagne, Georges Blondel. — Histoire de la civilisation dans le sud-ouest de la France, Camille Julian. — Un professeur français; M. Belot, M. Bayet. — Chronique, correspondance, nouvelles et informations, bibliographie, etc.

Revue de Géographie, December. Des rapports entre les populations et le climat sur les bords européens de la Méditerranée, M. Vidal-Lablache. — La société de topographie de France et l'école de géographie, M. Bardoux. — De la constitution de la science géographique, M. L. Drapeyron. — De la topographie appliquée à la colonisation de la côte occidentale d'Afrique, M. Ch. Borer. — Le mouvement géographique, M. Delavau.

Revue de l'enseignement secondaire, Jan. 1. — Revue de quinzaine, M. Zevort. — Les essais de Montaigne; notre bibliographie, M. Gustave Allais. — Agrégation de l'enseignement spécial en 1887; Bibliographie spéciale. — L'anglais, langue complémentaire de l'allemand, M. G. S.

Revista de la association de Maestros, October (Buenos Aires). — Horarios escolares (carta de Berra.) — Reformas escolares, conferencia por el profesor normal Pablo A. Pizzurno. — Las reuniones pedagógicas y los horarios. — Una estátua a Pestalozzi. — Parásitos de la educacion (artículo dedicado á todos los superintendentes). — Indicationes útiles á los maestros.

Rivista pedagogica italiana, Dec. 15. — Un' inchiesta psicologica sull' infanzia, E. Mortelli — Militarizzazione o semi-militarizzamento dei convitti nazionali, A. Gelmini. — I lavoro manuale nella scuola popolare (continuazione e fine), C. Grimaldi. — Sul passaggio delle scuole elementari allo stato. — Poche osservazioni di un maestro elementare, A. Gnutti. — Dalle varie provincie del regno. — L'istruzione primaria in Livorno, Plinio. — Qua e la frai programmi didattici, F. Veniali. — Libri e giornali. — Intorno all' insegnamento agrario nelle scuoli rurali. — Le scienze naturali nelle scuole elementari.

Zeitschrift für Schul-geographie, January. — Die Verwertung deutscher Dichtung und Sage für den geographischen Unterricht, S. Gorge. — Der erdkundliche Unterricht an den höheren Mädchenschulen in Deutschland. — Winnipeg. — Repertorium der methodischen Literatur. — Reliefkarten. — Notizen, Zeitschriften, u.s.w.

Educational articles in miscellaneous periodicals.

Alternative to socialism, the. Unsigned. *London quarterly review*, January.

Droit naturel et la science sociale, le. M. H. Joly, *Nouvelle revue*, Jan. 1.

Enseignement secondaire et les dernières réformes, l'. M. Gabriel Compayré. *La revue generale*, Jan. 1.

Faith and physical science. W. H. Mallock, *Forum*, February.

Generalizations of science, the. Prof. C. L. Morgan, *Mind*, January.

How I was educated. Andrew D. White. *Forum*, February.

Laws of habit, the. Prof. William James. *Popular science monthly*, February.

McCosh, James, the president of Princeton college. *Century magazine*, February.

Méthode expérimentale chez les anciens, la. V. Brochard. *Revue philosophique*, January.

Mouvement intellectuel, le. MM. Frary et Bourget. *Nouvelle revue*, Jan 1.

Pensée, la. A. Gautier. *Revue scientifique*, Jan 1.

Physiological selection. George J. Romanes. *Nineteenth century*, January.

Political economy in America. Dr. R. T. Ely. *North American review*, February.

Question du Latin en Allemagne, la. M. Schwiedland. *Revue scientifique*, Jan. 1.

Ranke and his method. Dr. J. H. W. Stuckenberg. *Andover review*, February.

Religious exercises in state schools. Prof. N. R. Davis. *Forum*, February.

Renan's later works. Andrew Lang. *Fortnightly review*, January.

Schools as prisons and prisons as schools. Lord Norton. *Nineteenth century*, January.

School of English literature, a. Unsigned. *Quarterly review*, January.

Science in religious education. Daniel G. Thompson *Popular science monthly*, February.

Spencer's 'Unknowable.' Unsigned. *Scottish review*, January.

University of London, the. Unsigned. *Quarterly review*, January.

Publications received at Editor's Office, Feb. 7-12.

BASTIAN, A. Die Seele indischer und hellenischer Philosophie in den Gespenstern moderner Geisterseherei. Berlin, Weidmann. 223 p. 12°. (New York, Stechert, $2.20.)

BAUMGARTEN, P. Lehrbuch der pathologischen Mykologie. Hälfte i. Braunschweig, Bruhn. 220 p. 8°. (New York, Stechert, $2.20.)

BAUNACK, J. und T. Studien auf dem Gebiete des griechischen und der arischen Sprachen. Band i. teil 1. Leipzig, Hirzel. 218 p. 8°. (New York, Stechert, $2.20.)

BAYLEY, W. S. A summary of progress in mineralogy and petrography, in 1886. Philadelphia, Amer. nat. [40] p. 12°.

COLLITZ, H. Die neueste Sprachforschung und die Erklärung des indogermanischen Ablautes. Göttingen, Vandenhoeck & Ruprecht. 40 p 8°. (New York, Stechert, 60 cents.)

COMPAYRE, G. Eléments d'instruction morale et civique. 65th ed. Paris, Delaplane. 207 p. 16°.

—— Same. Récits, exemples, préceptes, paraboles, fables. 100th ed. Paris, Delaplane. 138 p 16°.

—— Notions élémentaires de psychologie. Paris, Delaplane. 299 p. 12°

DAHL, F. Die Nothwendigkeit der Religion, eine letzte Consequenz der darwinschen Lehre. Heidelberg, Weiss. 112 p. 8°. (New York, Stechert, 75 cents.)

DIEDERICHS, A. Unsere Selbst- und Schmelz-laute (auch die englichen) in neuem Lichte. Strassburg, Trübner. 315 p. 8°. (New York, Stechert, $1.90.)

DU BOIS-REYMOND, E. Reden von. Zweite folge. Biographie, Wissenschaft, Ansprachen. Leipzig, Veit. 589 p. 8°. (New York, Stechert, $3.30.)

ELSAS, A. Ueber die Psychophysik. Marburg, N. G. Elwert. 76 p. 8° (New York, Stechert, 75 cents.)

FREY, T. Zur Bekämpfung zweitausendjähriger Irrthümer. Leipzig, Fritsch. 84 p. 8°. (New York, Stechert, 55 cents.)

FRITZ, J. Aus antiker Weltanschauung. Hagen i. W., Risel. 433 p. 8°. (New York, Stechert, $2.60.)

GAENGE, C. Lehrbuch der angewandten Optik in der Chemie. Braunschweig, Vieweg. 463 p. 8°. (New York, Stechert, $6.60.)

GROEBER, G. Grundriss der romanischen Philologie. Lief. i. Strassburg, Trübner. 280 p. 8°. (New York, Stechert, $1.50.)

GUESSFELDT, P. In den Hochalpen. 2d ed Berlin, Allgemeiner Verein für deutsche Literatur. 349 p. 12°. (New York, Stechert, $2.20.)

HERING, E. Ueber Newton's Gesetz der Farbenmischung. Prag, Tempsky. 92 p. 8°. (New York, Stechert, 55 cents.)

HILGARD, E. W. Alkali lands, irrigation and drainage in their mutual relations. Sacramento, State. 45 p. 8°

HILGENFELD, D. A. Judenthum und Judenchristenthum, eine Nachlese zu der "Ketzergeschichte des Urchristenthums." Leipzig, Reisland. 122 p. 8° (New York, Stechert, 90 cents.)

JACOBSEN, O. Die Glycoside. Breslau, Trewendt. 174 p. 12°. (New York, Stechert, 70 cents.)

KOHL, F. G. Die Transpiration der Pflanzen und ihre Einwirkung auf die Ausbildung pflanzlicher Gewebe. Braunschweig, Bruhn. 124 p. 8°. (New York, Steckert, $3.30.)

LANGE, L. Die geschichtliche Entwickelung des Bewegungsbegriffes und ihr voraussichtliches Endergebniss. Leipzig Engelmann. 141 p. 8°. (New York, Stechert, $1.10.)

MEUSEL, E. Die Quellkraft der Rhodanate und die Quellung als Ursache fermentartiger Reaktionen. Gera, Reisewitz. 36 p. 8°. (New York, Stechert, 55 cents.)

Calendar of Societies.

Philosophical society, Washington.

Feb. 12.—H. A. Hazen, The sky-glows of 1883; Bailey Willis, Bay's Mountains, Tennessee; G. Brown Goode, The geographical distribution of scientific men and institutions in the United States.

Chemical society, Washington.

Feb. 10.—R. B. Riggs and J. E. Whitfield, on some new meteorites; C. A. Crampton, Analysis of sugar-cane and beet-juices, etc.

Torrey botanical club, New York.

Feb. 8.—F. J. H. Merrill, Exhibition of plants collected at Tampa and Key West, Fla., and Collin and Robertson counties, Tex., in 1886.

Boston scientific society.

Feb. 8.—Some errors in relation to the art of the mound-builders; A splendid meteor; Furs out of season; S. Garman, On Massachusetts snakes.

Sedalia natural history society.

Nov. 8.—G. C. Broadhead, The geology of western Missouri.

Dec. 13.—H. M. Specking, Natural history and the use of the microscope.

Jan. 10, 1887.—F. A. Sampson exhibited a fine skull of the Coryphodon; Mrs. C. Demuth, Reptiles, *Election of officers.*—President, Dr. J. W. Trader; vice-president, H. C. Sinnett; corresponding secretary, F. A. Sampson; recording secretary, J. W. Walker.

Missouri university club, Columbia.

Feb. 7.—R. E. Call, The present status of the doctrine of descent.

Advertised Books of Reference.